

Service Manual

Colour Video Cameras
WVP-G1E/WVP-G1N



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Service Manual

Vol. 1

Circuit Description

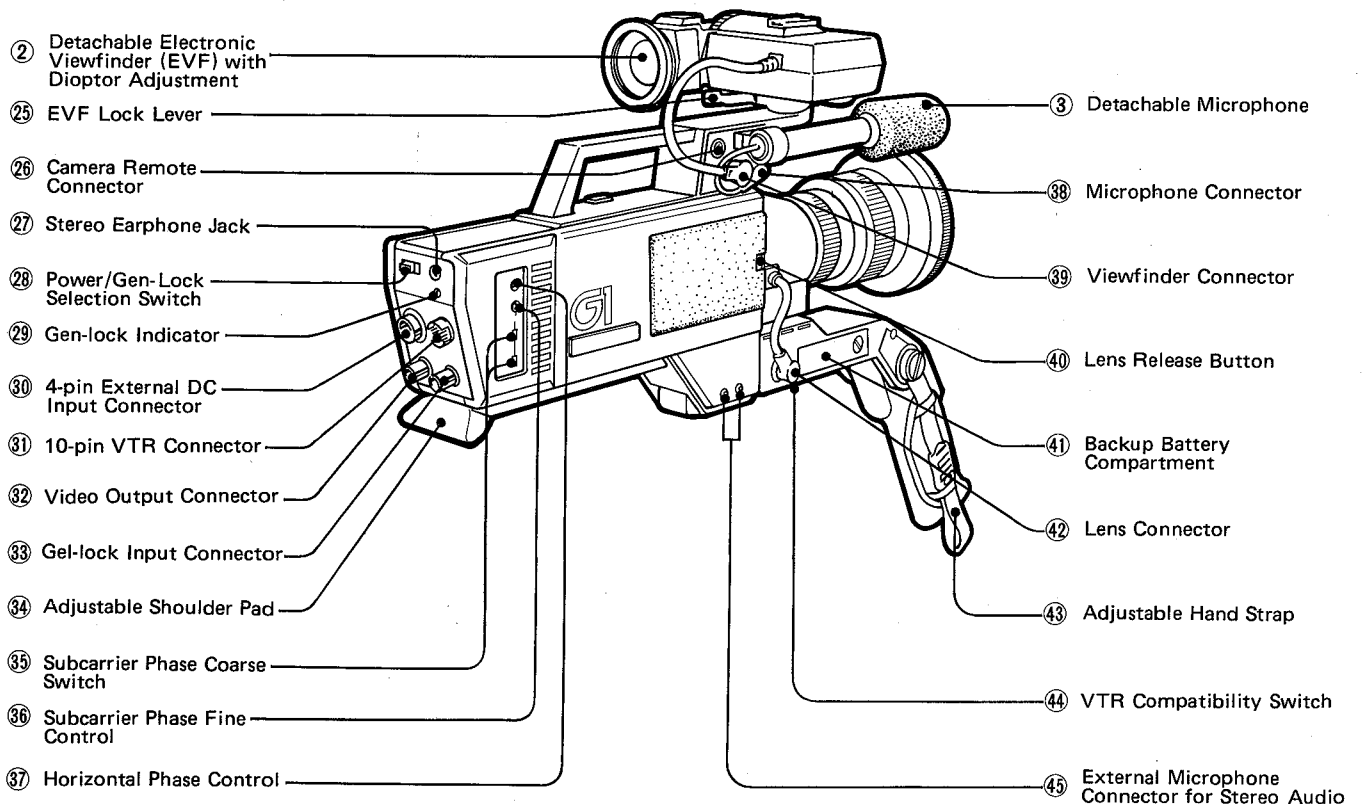
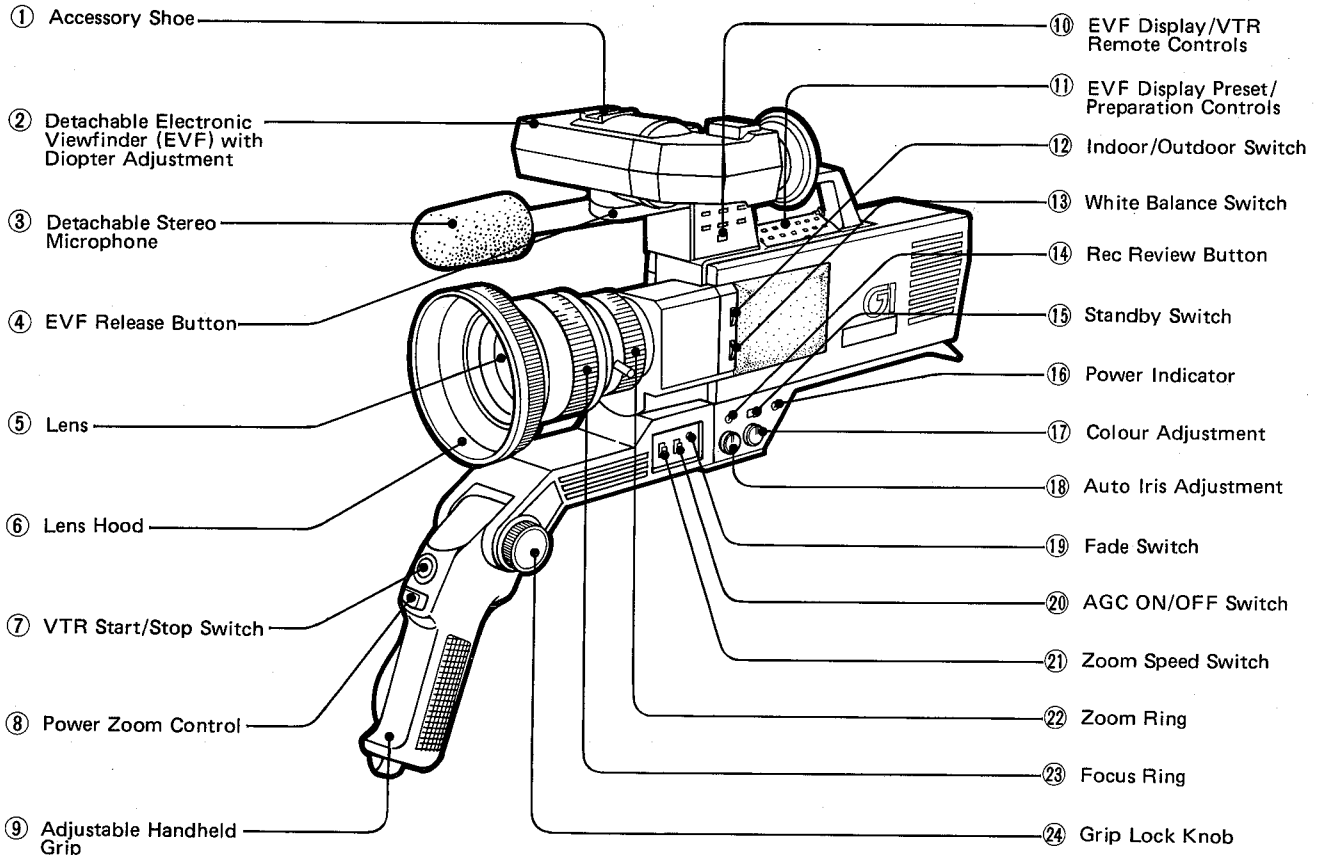
Colour Video Cameras

WVP-G1E/WVP-G1N

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MAJOR OPERATING CONTROLS



CAMERA

1 Accessory Shoe

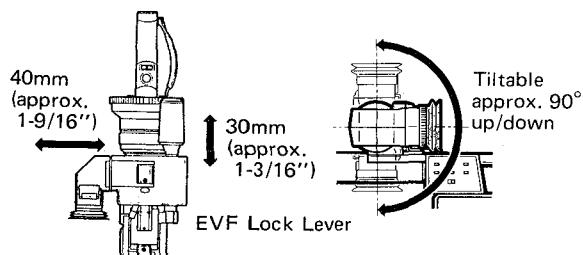
The accessory shoe is used for attaching an optional Camera Remote Controller.

2 Detachable Electronic Viewfinder (EVF) with Diopter Adjustment

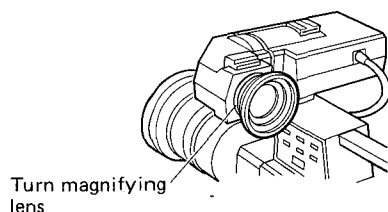
This is a small (1-3/8") B/W TV monitor showing the actual picture which the lens sees or VTR playback and displays multi-function graphics.

The electronic viewfinder can be adjusted as;

- 30mm (approx. 1-3/16") backward and forward.
- 40mm (approx. 1-9/16") right and left.
- Tilttable approx. 90° up and down.

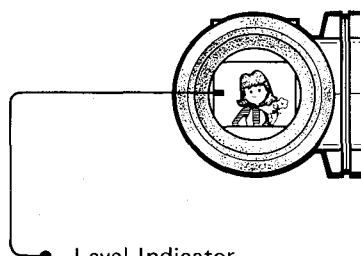


- Diopter Adjustment : $D = -0.5 \sim -4$



By turning the magnifying lens, the diopter of EVF eyepiece can be adjusted between -0.5 and -4 .

The electronic viewfinder can also be detached from the camera and used with the optional Camera Remote Controller (WV-CR10E). See page 34.



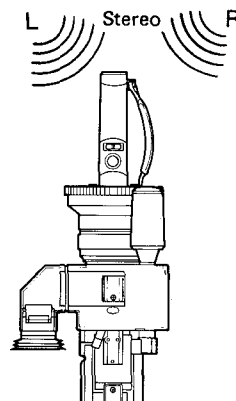
Level Indicator

This level indicator shows the insufficient illumination when this level indicator is moved to the lower position.

In this case, open the lens iris or additional illumination is required.

3 Detachable Stereo Microphone (for stereo audio VTR)

The stereo microphone is unidirectional and is more sensitive to sounds coming from the direction.



4 EVF Release Button

To detach the EVF, press EVF Release Button up.

5 Lens

This is a F2.0 - 12:1 auto iris power zoom lens which directs the incoming light into the camera tube.

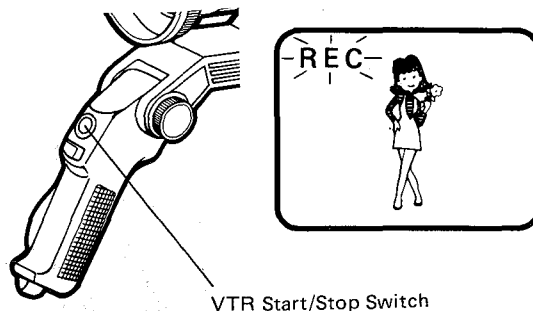
6 Lens Hood

This blocks out unwanted external light to the lens.

7 VTR Start/Stop Switch

This is a push-push type switch which is used to change the recorder from pause (Record/Pause) to record. Push the switch once and the recorder will start to record, as shown by the blinking "REC" graphics in the viewfinder.

Push the switch again and the recorder will pause (Record/Pause), and the blinking "REC" graphics will disappear. This switch is only operative when remote pause is connected, i.e. camera cable is connected directly to VTR and Remote operation is selected.



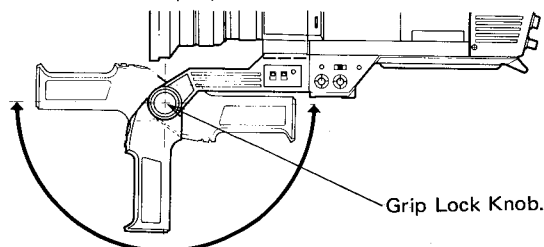
8 Power Zoom Control (W/T)

The zoom lens allows you to "zoom" in/out for a closer/wider angle picture with motor drive, which is activated by the power zoom control switch.

9 Adjustable Handheld Grip

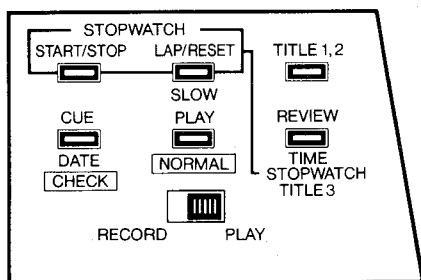
This convenience feature permits the operator to adjust the handheld grip to the most comfortable position.

Loosen the Grip Lock Knob (24), set the handheld grip in the desired position and then tighten the Lock Knob (24).



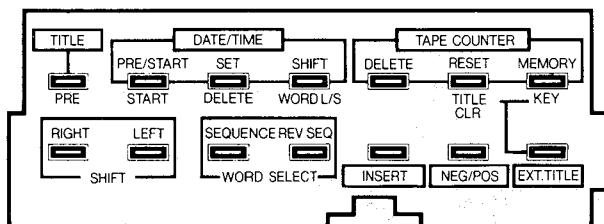
10 EVF Display/VTR Remote Controls

The EVF display of the camera for the Title, Date, Time, Stopwatch and Check Operation can be read out and the VTR playback modes of the specified portable VTR such as Panasonic NV-100 and NV-180 can be remotely controlled by this keyboard.



11 EVF Display Preset/Preparation Controls

The EVF display of the camera for the Title, Selection of title colour, Date, Time, Insert and Negative/Positive can be preset by this keyboard before the camera is operated.



12 ☀ : Indoor/ ☀ : Outdoor Selection Switch (Colour Temperature Setting)

Optimum colour pictures can be achieved by compensating the incoming light conditions. This switch selects the approximate corrections for ☀ : indoor or ☀ : outdoor.

The colour temperatures for indoor and outdoor are 3200°K (☀ : indoor) and 5500°K (☀ : outdoor). The CHECK OPERATION will indicate the position of this switch.

13 White Balance Switch (WHITE BALANCE/SET)

The white balance setting will be necessary when the "WHITE" graphics is blinking in the EVF under the following situations as:

- When the camera is first turned on.
- When the ☀ : Indoor/ ☀ : Outdoor switch is changed.

Place the White Balance Switch in the SET position to automatically activate white balance while aiming the camera at the white object such as white paper.

After approx. 3 seconds, the white balance is completed and the blinking "WHITE" graphics in the EVF will disappear or change to the "WHITE OK" graphics in CHECK OPERATION.

Then the switch should be placed in upper position for normal camera operation.

Note : (1) The white balance setting should be done at the centre (detent) position of the Colour Adjustment Knob.

(2) The white balance may not be properly balanced under low illuminations when the EVF of the camera displays the blinking "LIGHT"

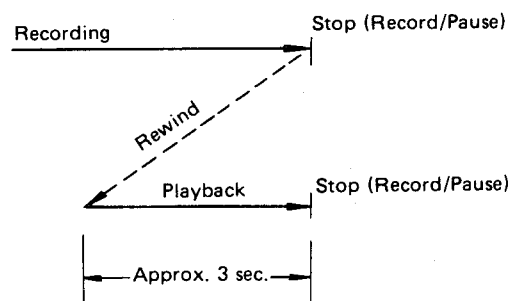
(3) The white balance setting should be done by shooting the camera to the white plane object such as white wall or paper.

(4) It is recommended that the white balance should be adjusted after a few minutes warm-up period.

14 Rec Review Button (REC REVIEW) for NV-180 portable VTR

When this camera is operated with Panasonic portable VTR NV-180, this function operates and this button only activates in the pause (Record/Pause) mode.

When this button is pressed after recording and the portable VTR is in pause mode, the portable VTR is automatically rewind the tape for quick review which playbacks the tape for approximately 3 seconds to make sure the recording conditions.



15 Standby Switch (STANDBY 1/2/ON)

This switch is used for longer battery operation and selects the conditions of the camera and the Panasonic portable VTR as;

ON : The camera and the portable VTR are operated normally.

STANDBY 1 : The cylinder motor of the portable VTR is OFF with the tape loaded and the camera functions are also OFF, except pick-up tube heater, EVF/CRT heater and Microprocessor.

When the camera and portable VTR are not used for 5 - 15 minutes, set the switch to the STANDBY 1 position.

STANDBY 2 : The cylinder motor of the portable VTR is OFF with the tape loaded and the camera functions including pick-up tube and EVF/CRT heaters are also OFF, except Microprocessor.

When the portable VTR and the camera are not used for longer than 15 minutes, set the switch to the STANDBY 2 position.

- Note :**
1. When the camera is operated with some of other manufacturer's VTR, the VTR may operate incorrectly in the standby mode of the camera.
 2. The white balance set previously is memorized even if the standby switch is set to the STANDBY position.

16 Power Indicator (POWER)

This lamp indicates as;

Red : When the standby switch is ON or STANDBY 1 positions.

Green : When the standby switch is STANDBY 2 positions.

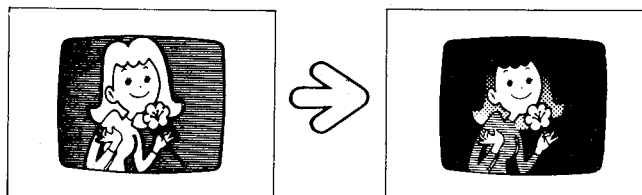
17 Colour Adjustment (BALANCE, RED/BLUE)

The red and blue colour are balanced and preset at the centre (detent) position which usually provides accurate colour reproduction. However, under some conditions it may be necessary to compensate by adjusting this control. To obtain the best possible colour, place the white balance switch in the SET position for automatic white balance at the centre detent position.

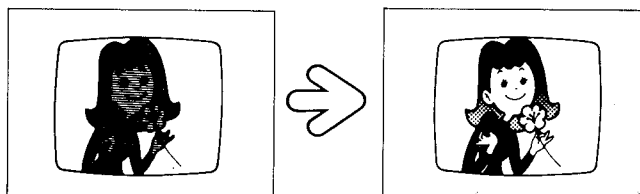
After the white balance is completed, place the white balance switch to the upper position for normal camera operation.

18 Auto Iris Adjustment (AUTO IRIS, CLOSE/OPEN)

This can manually adjust the lens iris opening to compensate for unusual lighting conditions. When the object is in bright light and the background is dark, adjust this knob to close the lens iris opening.



When the background is bright and the object appears to be too dark, adjust this knob to open the lens iris opening.



At the centre detent position, auto is for normal operation.

Note : This knob should be set to the centre detent position after the camera is used under unusual lighting conditions.

19 Fade Switch (FADE)

This switch can be used when the fade-in effect at the beginning of the recording or the fade-out effect at the end of the recording is desired. When this switch is activated, the graphic "F" is displayed in the EVF.

20 AGC ON/OFF Switch (AGC, ON/OFF)

The automatic gain control circuit (AGC) can be selected ON or OFF as;

ON position : The high sensitivity at low illumination is desired.

OFF position : The natural picture at low illumination is desired.

21 Zoom Speed Switch (ZOOM, FAST/SLOW)

This switch can select the two zoom speeds as,
FAST : Approx. 9 seconds
SLOW : Approx. 14.5 seconds

22 Zoom Ring/Manual Zooming

The picture size can be magnified 12 times with the use of the zoom feature. Just rotate the zoom ring for a close up (T) or wide angle (W) picture. For Macro close-up (as close as approx. 5cm from object), rotate the zoom ring to the Macro position. The Macro range is approx. 5cm - 1.3m.

23 Focus Ring

Turning the ring located on the lens will change the lens focus. Focusing the lens of the camera will change the viewfinder picture. To be sure that the object is in focus, observe the picture on your viewfinder and adjust the focus ring. The focusing range is 1.3m to infinity.

24 Grip Lock Knob

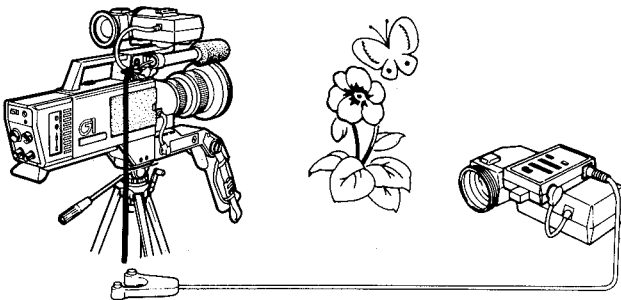
The angle of Handheld Grip (9) can be adjusted by loosening this knob. Tighten the knob after setting the grip position.

25 EVF Lock Lever

The EVF position can be locked by this lever.

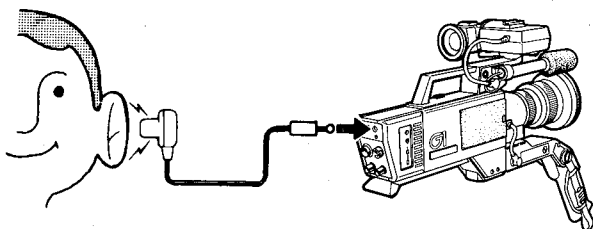
26 Camera Remote Connector (CAMERA REMOTE)

This connector is a receptacle for the connection of the optional Camera Remote Controller (WV-CR10E).



27 Stereo Earphone Jack (M3) (EAR)

- When the stereo earphone (not provided) is connected, the stereo microphone sound of the camera can be monitored.
- When the mono earphone (not provided) is connected, the CH1 (L)/mono microphone sound of the camera can be monitored.



28 Power/Gen-lock Selection Switch (SELECT, EXT DC/VTR/MIXER)

This switch selects the power and gen-lock signal source for the camera as;

EXT DC : The camera is operated by the DC power supplied to the External DC Input Connector (30) and can be synchronized by the gen-lock signal fed to the Gen-lock Input Connector (33).

VTR : The camera is operated by the DC power supplied from the VTR or the Power Supply through the 10-pin VTR Connector (31) and can be synchronized by the gen-lock signal fed to the Gen-lock Input Connector (33).

MIXER : The camera is operated by the DC power supplied from the Panasonic Production Mixer WJ-S1 through 10-pin VTR Connector (31) and synchronized by the gen-lock signal from the WJ-S1 through the 10-pin VTR Connector (31).

Note: When this switch is set to MIXER position and this camera is used with the production Mixer WJ-S1, do not supply the gen-lock signal to the gen-lock input connector (BNC type) (33). This action may disturb the proper gen-lock function.

Gen-Lock: Cameras for occasional use in studio operations or production must be capable of being synchronized with other cameras or a reference source for sync or video. Where the outputs of two or more cameras are combined at the Production Mixer WJ-S1 for example, each camera in the system must be synchronized.

Synchronization was formally achieved by driving all cameras from a master sync generator. Today, it is more common for a signal source of video, which may be a camera, to be designated the master for synchronization purpose.

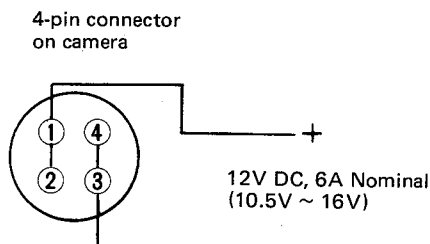
This master unit operates from its own internal sync generator and the cameras are supplied with composite video or black burst from the master. The internal synchronizing circuit in each camera locks their sync and subcarrier to that of the master. This system, called genlock, modifies the camera's sync generator operation to keep in lock.

29 Gen-lock Indicator (GEN-LOCK)

This indicator lights ON when the gen-lock signal (composite or black burst signal) for external synchronization is supplied to 10-pin VTR connector (31) from the Production Mixer WJ-S1 or to the Gen-lock Input Connector (BNC) (33) from the system reference.

30 4-pin External DC Connector (EXT DC)

This connector is used for introducing external DC power source from external battery or AC Adaptor.



31 10-pin VTR Connector (VTR)

This connector is used to connect the detachable 10-pin camera cable between the camera and portable VTR, optional power supply or Production Mixer WJ-S1.

The 10-pin camera cable carries power and gen-lock signal (only for WJ-S1) to the camera and video picture information from the camera to the portable VTR, power supply or Production Mixer.

32 Video Output Connector (BNC) (VIDEO OUT)

The separate PAL composite video signal is available here.

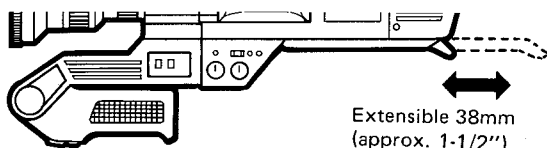
33 Gen-lock Input Connector (GEN-LOCK)

The colour video signal of the camera is automatically synchronized to the signal (gen-lock signal : Composite or black burst) which is introduced into this connector from the system reference such as a special effects generator.

Caution : If the gen-lock input signal contains much jitter such as VTR playback signal, the camera may not be synchronized properly.

34 Adjustable Shoulder Pad

The shoulder pad can be extended 38mm (approx. 1-1/2 inch) for comfortable position.



35 Subcarrier Phase Coarse Switch (SC PHASE)

The subcarrier phase of the camera signal is adjusted from 0° to 360° in 90° step with this switch as shown below for matching the phase of subcarrier signal at the gen-lock input connector (33) or the gen-lock signal fed through the 10-pin VTR connector (31).

This switch should be set when the camera is used in the system using the special effects generator or production mixer.

SC Phase	0°	90°	180°	270°
Position of Switches				

36 Subcarrier Phase Fine Control (FINE)

This control allows fine adjustment of the subcarrier phase set by the subcarrier phase coarse switch (35). It gives continuous control of up to plus 90° subcarrier phase to match the phase of subcarrier signal at the gen-lock input connector (33) or the gen-lock signal fed through the 10-pin VTR connector (31). This control should be adjusted as well as the Subcarrier Phase Coarse Switch (35) when the camera is used in the system using the special effects generator or production mixer.

37 Horizontal Phase Control (H PHASE)

The horizontal phase of the camera signal is adjusted to match the H phase of the signal at the gen-lock input connector (33) or the gen-lock signal fed through the 10-pin VTR connector (31).

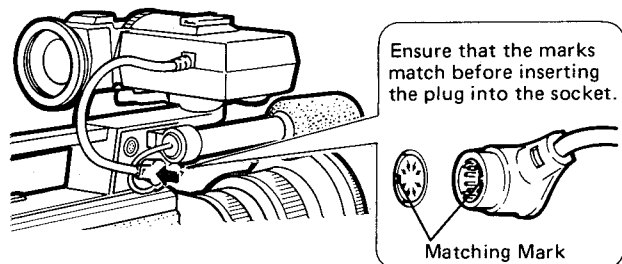
This control should be adjusted when the camera is used in the system using the special effects generator or production mixer.

38 Microphone Connector (INT MIC)

This connector is used to connect the detachable stereo microphone.

39 Viewfinder Connector (VIEWFINDER)

This connector is a receptacle for the connection of the electronic viewfinder.



40 Lens Release Button

This button is used for releasing the lens from the camera.

To release the lens from the camera, press this button to unlock the bayonet mount and rotate the lens approx. 65° clockwise.

41 Backup Battery Compartment

The backup battery (SUM-3, AM-3 or AA size) is installed into this compartment to memorize the internal titles and also to function the date and the time continuously even if the camera power source is off.

42 Lens Connector (12 pin)

Use to connect the lens cable.

43 Adjustable Hand Strap

The hand strap can be adjusted for holding the camera firmly.

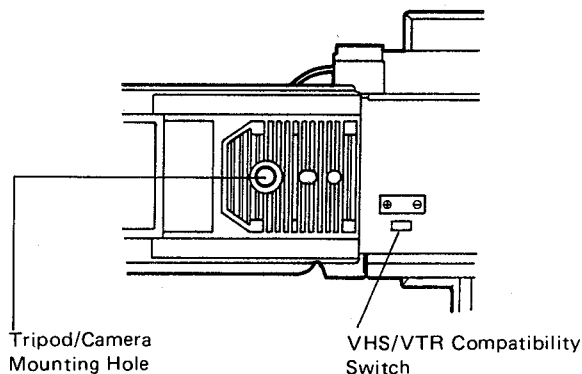
44 VHS/VTR Compatibility Switch

The logic level of the camera trigger for different polarity of VHS/VTR may be incompatible and reversed, so that the VTR pauses when it should run and vice versa. In this case, set the switch position to other side.

When this camera is connected with Panasonic portable VTR, set the switch to ⊕ position.

When this camera is connected with VHS portable VTR of other manufacturer, set the switch to ⊖ position.

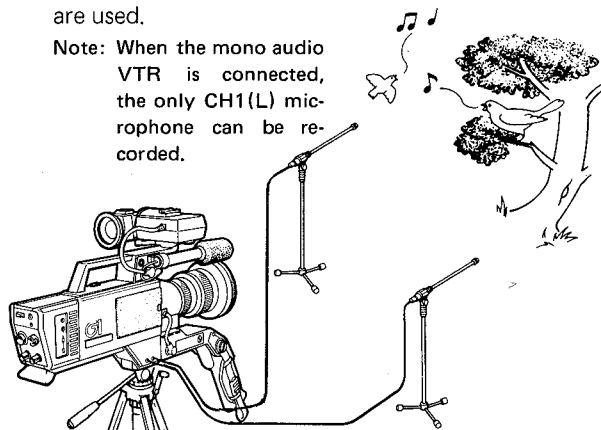
Note : Some of VHS portable VTR of other manufacturer may not be operated properly.



45 External Microphone Connector (for stereo audio VTR)

These connectors are used to connect external microphones (not supplied). When external microphones are connected, the camera's detachable microphone will not work. The M3 size connectors are used.

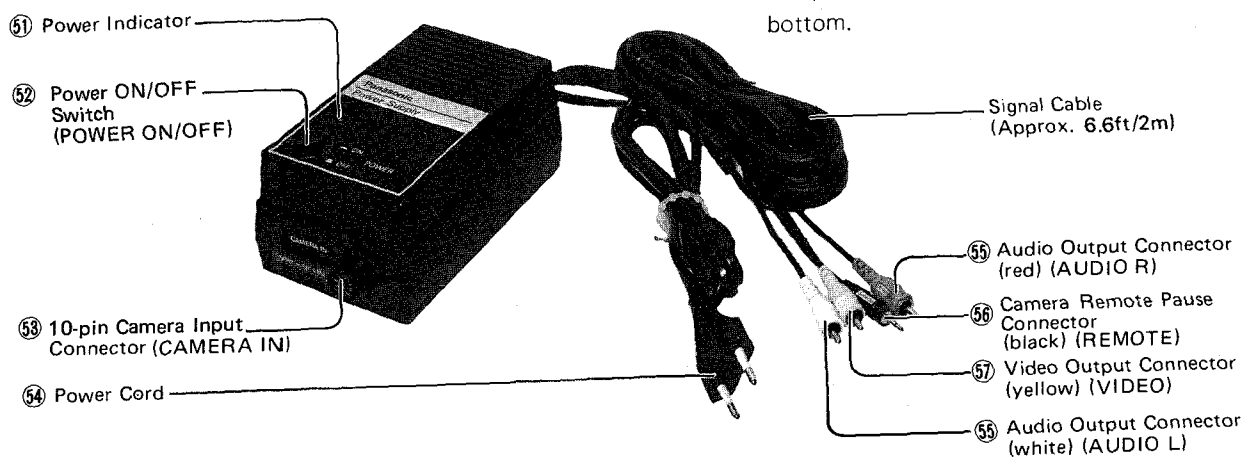
Note: When the mono audio VTR is connected, the only CH1(L) microphone can be recorded.



Optional Power Supply WV-PS01AE

Caution: The power supply WV-PS01AE/B is provided with BASEC power cord which is no AC plug.

Note: Before attempting to connect or operate this product, please read the label on the bottom.



OPTIONAL POWER SUPPLY

51 Power Indicator

This light indicates that the power supply and camera are on.

52 Power ON/OFF Switch (POWER ON/OFF)

This is push-push type switch which turns the power supply and camera ON and OFF.

Push once and the switch remains down keeping the power supply ON.

Push again, the switch comes up, turning the power supply OFF.

53 10-pin Camera Input Connector (CAMERA IN)

Connect the camera cable connector here. Be sure the cable connector is fitted securely to the input connector.

54 Power Cord Plug

Connect the two prong plug to a AC power source (220V - 240V).

55 Audio Connectors

Connect these connectors to the audio inputs of the recorder as;

White Colour: Audio for CH1 (L)

Red Colour: Audio for CH2 (R)

56 Remote Pause Connector (Black)

Connect this black connector to the remote pause connector of the video cassette recorder.

This allows you to control the recorder using the VTR Start/Stop switch on the camera.

Note : The remote pause cable does not have to be connected between the recorder and the power supply to record. But if disconnected, the VTR Start/Stop switch on the camera will not pause the recorder.

57 Video Connector (Yellow)

Connect this yellow connector to the video input connector of the video cassette recorder.

SPECIFICATIONS

CAMERA WVP-G1E/WVP-G1N

Power Source :	12V DC (through 10-pin or 4-pin connector selectable)
Power Consumption :	Approx. 6 Watts (Approx. 1.2 Watts at STANDBY 1, Approx. 0.3 Watts at STANDBY 2)
Pick-up System :	Single tube frequency separation system
Pick-up Tube :	One high-band (5MHz) 2/3" integral stripe filter electrostatic focus, magnetic deflection, separate mesh NEWVICON [®] tube
Scanning :	625 lines/50 fields/25 frames per second
Synchronizing System :	Internal or external (gen-lock) switchable automatically
	Internal : PAL standard
	External (gen-lock) Input : PAL composite signal or black burst signal (through 10-pin or BNC connector)
Subcarrier Phase for Gen-lock :	Adjustable more than 360
Horizontal Phase for Gen-lock :	Adjustable from -0.1 μ sec to +1.8 μ sec
Video Output Level :	1.0Vp-p PAL composite/75 ohms x 2 (10-pin and BNC connector)
Horizontal Resolution (Luminance) :	350 lines at center
Single to Noise Ratio (Luminance) :	46 dB (AGC OFF)
Illumination Required :	1400 lux
Required Minimum Illumination :	20 lux at F2 (AGC ON)
Microphone :	Unidirectional Electret Condenser Stereo Microphone
External Microphone Input :	-72 dB/600 ohms unbalance, M3 Jack
Audio Output :	-20 dB/High Impedance
Earphone Output :	8 ohms, M3 Jack
Lens :	12:1 Automatic Light/Iris Control, Power zoom ; 10 - 120mm F2, Filter Diameter/ 72 mm
Zoom Speed :	FAST : Approx. 9 seconds, SLOW : Approx. 14.5 seconds
Lens Mounting :	Bayonet
Viewfinder :	1.5" Electric Viewfinder (actual visual size 1-3/8", measured diagonally) with graphics display
White Balance :	Automatic Setting
Maximum Camera Cable Length :	20m
Ambient Operating Temperature :	0°C - 40°C
Ambient Operating Humidity :	Less than 90%
Camera Mounting :	One 1/4 -20 threaded hole standard camera tripod
Dimension :	158(W) x 232(H) x 413(D) mm
Weight :	2.7 kg

1 Principle of Single Carrier Frequency Multiplexing System using a Single Tube

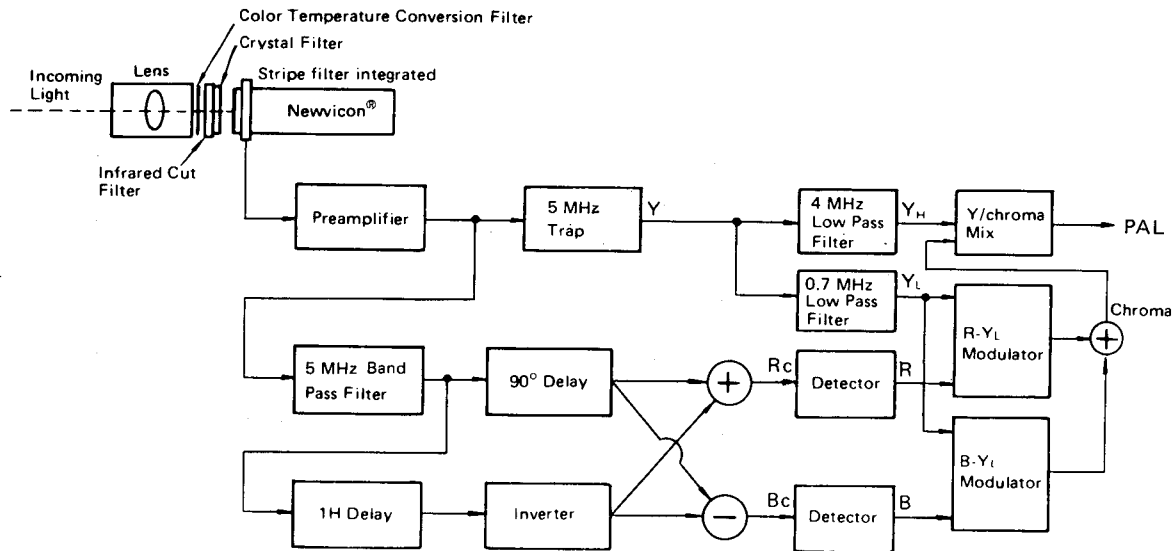


Fig.1-1 Principle of Single Carrier Frequency Multiplexing System using a Single Tube

The incoming light to the camera which passes through the automatic iris control(AIC) lens, the color temperature conversion filter, the infrared(IR) cut filter and the crystal filter reaches the surface of the integrated stripe filter in a 2/3" pick-up tube (S4165P).

The diffusion filter is inserted between the AIC lens and the color temperature conversion filter when the white balance switch is set to the SET position.

Color Temperature Conversion Filter

Generally, the human eye is sensitive to electromagnetic waves from $380\text{m}\mu$ ($\text{m}\mu=\text{nm}$) to $780\text{m}\mu$ in wavelength- (the visible region). In addition, the human eye also discerns the wavelength difference as a color difference. The human eye responds to the light between $400\text{m}\mu$ to $500\text{m}\mu$ wavelength as predominantly blue information, the light between $500\text{m}\mu$ to $600\text{m}\mu$ as green information, and the light between $600\text{m}\mu$ to $700\text{m}\mu$ as red information. The entire light in the "visible" range of wavelength from $380\text{m}\mu$ to $780\text{m}\mu$ is seen as different amount of white light.

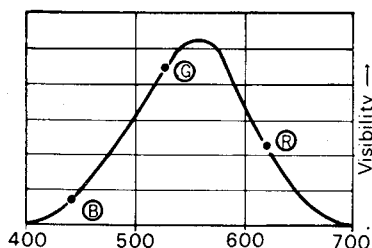


Fig. 1-2 Standard Luminosity Curve

When a carbon is burned, it emits light of a different quality depending on how hot it is. Various natural light can be expressed in terms of a color temperature which may be referred to a light emitted from the burning carbon used as a standard. A light source of 3200°K ($\text{K}=\text{Kelvin: } -273^\circ\text{C corresponds to } 0^\circ\text{K an absolute temperature}$) color temperature, which is used in studios, implies that its quality (color) is the same as that emitted from the carbon burning at 3200°K (2927°C). The relationship between the color temperature of light sources used for illumination and weather conditions are shown in Fig. 1-4. The color temperature goes up as the weather turns overcast from clear. This may be related to the burning carbon(charcoal) as follows. When the charcoal is heated and begins to glow (at low temperature), it emits a reddish light. But when it is so-called white hot (at high temperature), a bluish light is emitted. In other words, the light at a low color temperature is considered reddish and at high color temperature is considered bluish.

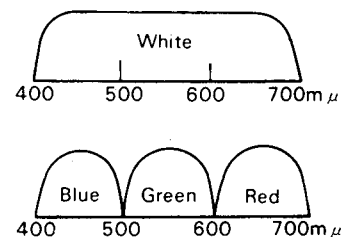


Fig. 1-3 The Visible Spectrum

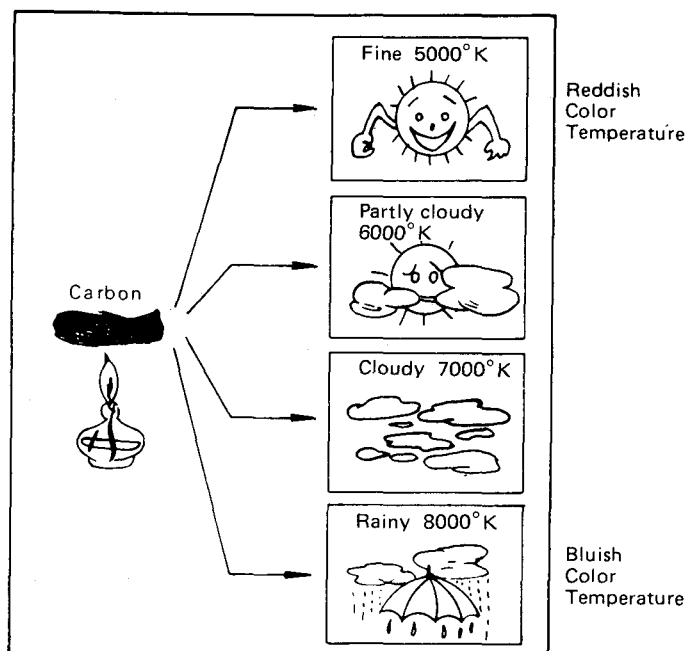


Fig. 1-4 Color Temperature and Weather Conditions

When a color camera is pointed at an object illuminated by a light of low color temperature, it reproduces a reddish picture.

When a color camera is pointed at an object illuminated by a light of high color temperature, it reproduces a bluish picture. The color camera has the indoor-outdoor selection switch which corrects for the color temperature of the light. When the switch is set to the outdoor position, the 5500°K COLOR TEMPERATURE CONVERSION FILTER is inserted into the light path to convert the color temperature from 5500°K to 3200°K. In addition to the indoor-outdoor selection switch utilizing the color temperature conversion filter, this camera is designed so that the level of red and blue signals can be changed independently to meet the color temperature of the light source in order to ensure proper color reproduction.

Infrared Cut Filter

As shown in Fig. 1-5, the pick-up tube has some sensitivity in the infrared region beyond the visible range. The infrared (IR) cut filter cuts off the infrared light rays which the human eye does not see as light. If the color signal is made by using the video signal corresponding to the infrared rays which the human eye can not normally see, the color of pictures on the monitor and that seen with the naked eye would differ substantially.

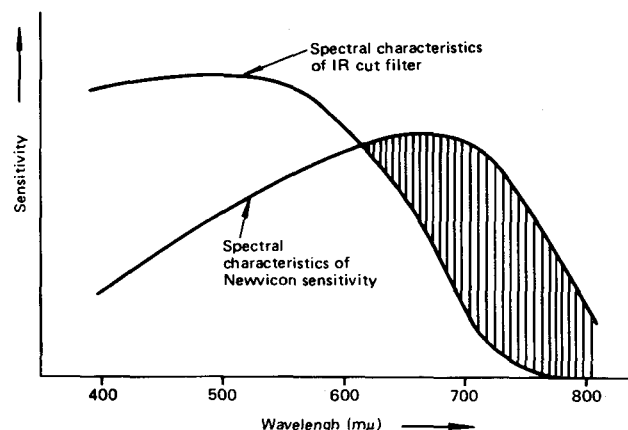


Fig. 1-5 IR Cut Filter Response

Crystal Filter

As described later, since the red and blue images are modulated by the fine stripe filter built into the pick-up tube, false signals could develop due to interference between the stripe filters and fine detail objects. The crystal filter is an optical low pass filter which prevents the occurrence of such false signals by blocking the high frequency components of images.

Diffusion Filter

When the white balance switch is set to SET position, the diffusion filter is inserted between the AIC lens and the color temperature conversion filter to diffuse the incoming light, and the whitish light reaches the pick-up tube.

Pick-up Tube

Different from that of the black and white camera, the pick-up tube used in this color camera has a built-in stripe filter, a metallic stripe called the optical black (OB) located on the face-plate. The video signal's black level is set in reference to the signal from the optical black.

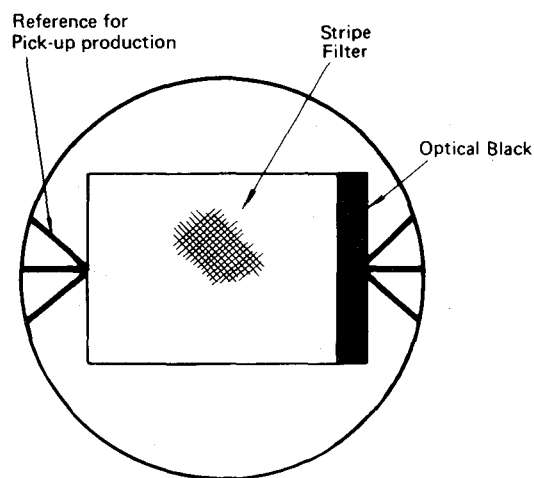


Fig. 1-6 Front View of S4165P Newvicon®

As shown in Fig.1-9 ⑥ , the stripe filter integrated into the pick-up tube consists of a cyan/transparent stripe filter section and a yellow/transparent stripe filter section. These stripe filters are so arranged as to be of the same pitch in the horizontal scanning direction, and have equal angles with respect to the vertical. The pick-up tubes even and odd scanning lines pass the tracks of the stripe filters that are arranged in the same way. In other words, the even and odd scanning lines are spaced "a" apart.

For easy understanding, let' assume that light of uniform level containing green(G), red(R), and blue(B) reaches the pick-up tube(Fig. 1-9 ④), and that the crosspoint of cyan and yellow stripe filter is scanned as shown in Fig. 1-9 ⑥ .

Let's consider the light output from the stripe filter. The cyan filter cuts off the red(R) light which is complementary to it, and the yellow filter cuts off the blue(B) light which is complementary to it. (Fig. 1-7).

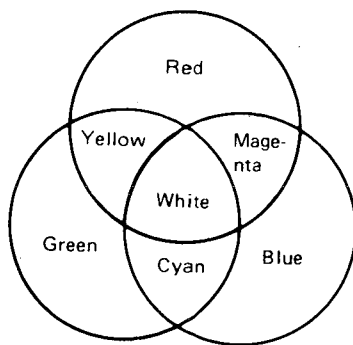


Fig. 1-7 Complementary Color

The light output ③ , which corresponds to the Nth scanning line contains the modulated R and B components, riding on top of unmodulated G component. The light output ④ , which corresponds to the N+1st scanning line contains the modulated R and B components, riding on top of the unmodulated G components. Light output ⑤ , ⑥ , and ⑦ correspond to N+2nd, N+3rd and N+4th scanning lines respectively. The light ③ for the Nth line and the light ⑦ for the N+4th line are exactly same.

The stripe filters have the same pitch in the horizontal scanning direction, and the same angle in the vertical directions so that there is a phase difference of 90° among modulated components.

The pick-up tube produces the video signal whose waveform is the same as the that of the light which comes from the stripe filter.

The modulation frequency for the R and B signals can be calculated from the following equation.

$$f = \frac{W \times 10^3}{p \times t} \quad (\text{MHz})$$

Here, f : Modulation frequency (MHz)

W : Horizontal width of effective scanning area of pick-up tube (mm)

p : Stripe filter pitch (μm)

t : Horizontal video signal duration (line duration (1H)-horizontal blanking duration (H.BL)) (μs)

Specially;

$$W = 8.07 \text{ mm}$$

$$p = 30.6 \mu\text{m}$$

$$t = 1H - H.BL = 64 - 12.03 = 51.97 \mu\text{s}$$

$$f = \frac{W \times 10^3}{p \times t} = \frac{8.07 \times 10^3}{30.6 \times 51.97} = 5 \text{ MHz}$$

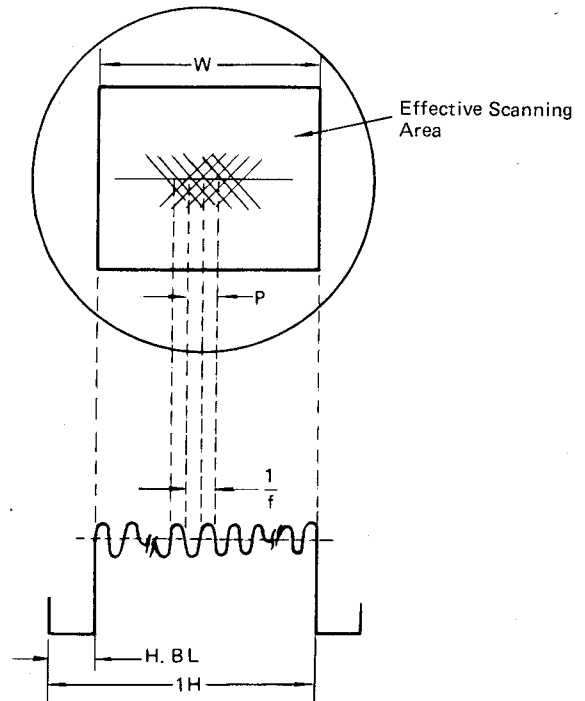


Fig. 1-8 Modulation Frequency

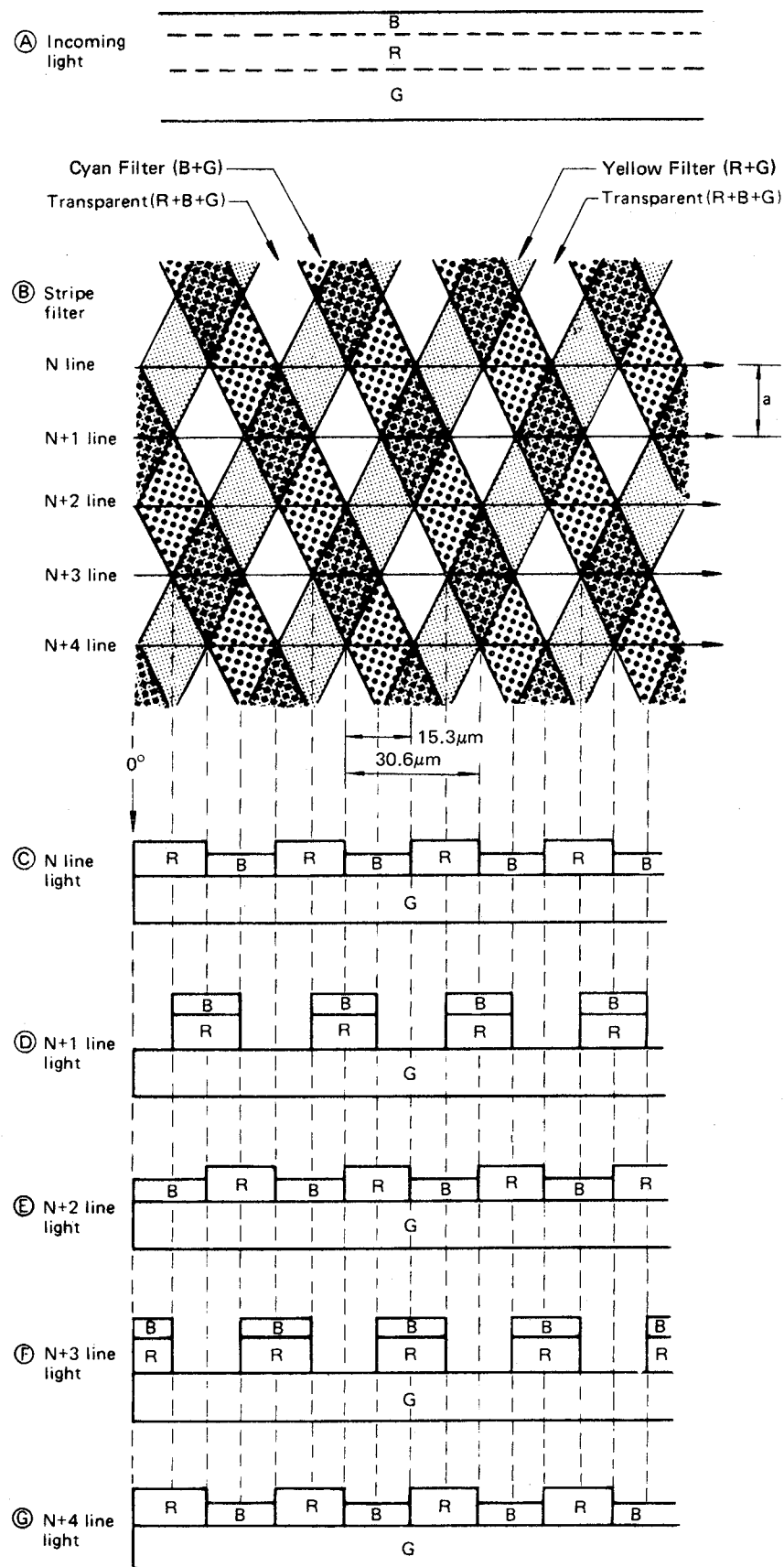


Fig. 1-9 Light from Stripe Filter

The incoming light is thus converted by the integrated stripe filter into a signal which contains R and B signals modulated by 5MHz, and the G signal.

This signal is sent to the preamplifier, where it is amplified. The amplified signal (H) (see Fig. 1-11) from preamplifier is sent to the 5MHz trap circuit, which passes only the luminance(Y) signal (I) comprising the G signal and the mean value of the modulated R and B signals. The mean value of modulated R and B signals on adjacent scanning lines are equal so that the luminance signal corresponding to two successive lines is also equal (see Fig. 1-10) due to the characteristics of the trap circuit.

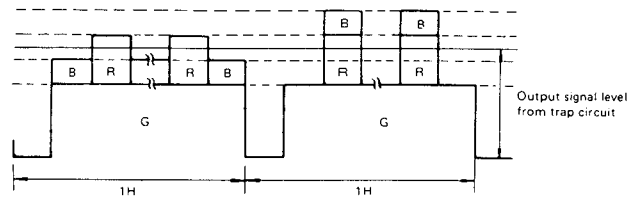


Fig. 1-10 Detection of Y signal

The Y signal thus obtained is supplied to the 4MHz low pass filter and the 0.7MHz low pass filter. The luminance(YH) signal having high frequency response and the luminance signal (YL) having low frequency response come out from these low pass filters.

The YH signal is supplied to the Y/chroma mix circuit and the YL signal to the R-YL and B-YL modulator circuits.

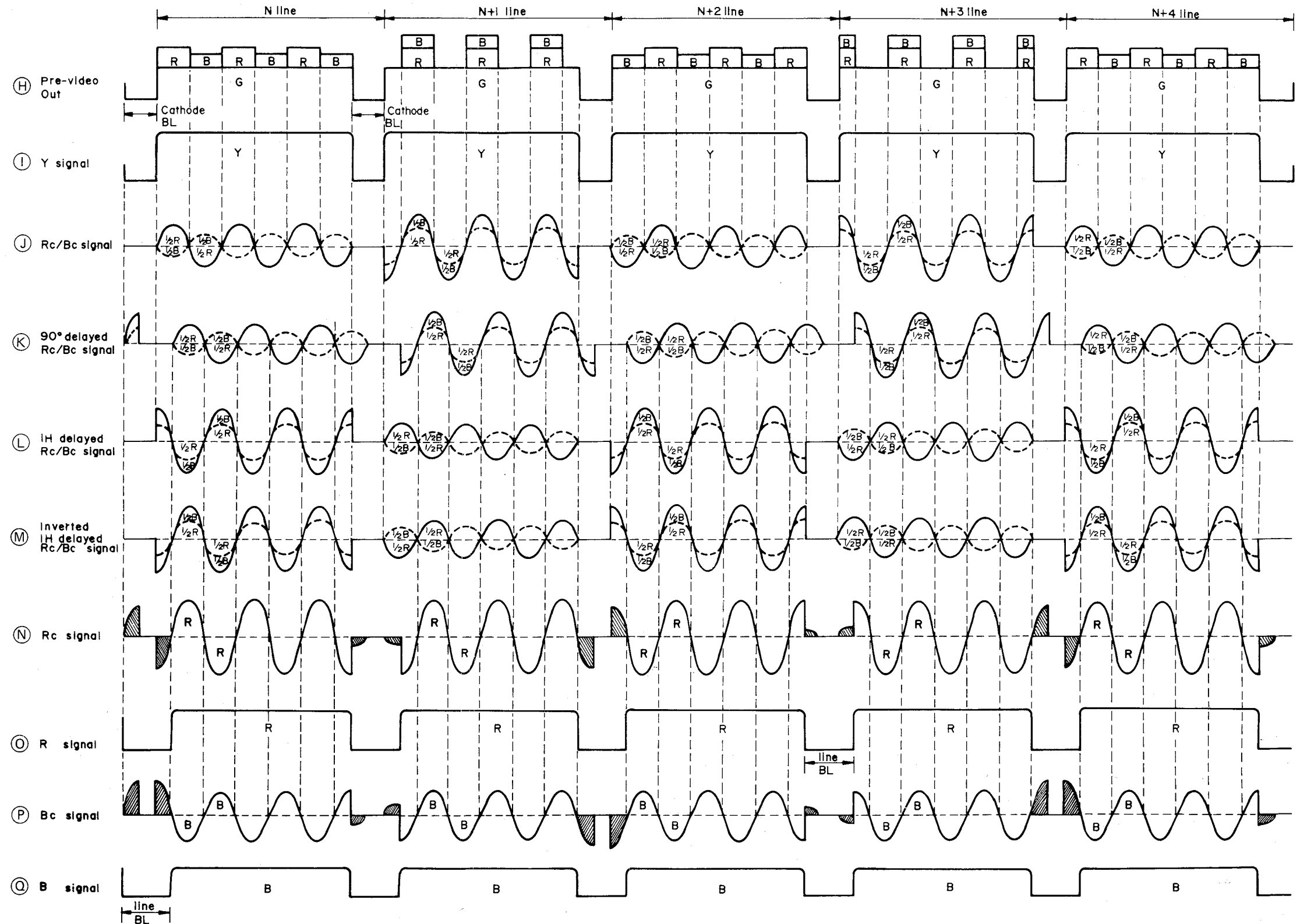
The amplified signal (H) is also supplied to the band-pass-filter (B.P.F.) whose center frequency is 5MHz and through which only the 5MHz modulated signal (J) passes.

The modulated signal (J) is sent to the 90° phase shift circuit and the 1H(1 line) delay circuit, from which 90° phase shifted and 1H delayed modulated signals (K) and (L) are obtained.

The 1H-delayed modulated signal (L) is inverted and the signal (M) is obtained. The modulated R(Rc) signal (N) is obtained by adding the modulated signals (K) and (M), and the modulated B(Bc) signal (P) is obtained by subtraction of the modulated signals (K) and (M). The shaded portions on the signals (N) and (P) are removed by mixing the line blanking pulse.

The Rc and Bc signals obtained by addition and subtraction are supplied to detectors, from which R signal (O) and B signal (Q) are obtained. The R signal and B signal thus obtained are fed to the R-YL and B-YL modulator circuits respectively.

The chrominance signal obtained by mixing the R-YL and B-YL modulated signals is supplied to the Y/chroma mix circuit where it is mixed with the luminance(YH) signal to result in a PAL signal.



*Shaded portions are removed by mixing the line blanking pulse.

Fig. 1-11 Detection of Y, R and B Signals

2 Preamplifier Board

Outline

This circuit amplifies the signal current is $(0.2\mu\text{A}-0.3\mu\text{A})$ from the pick-up tube.

The amplified video signal is delivered to the Signal Processing circuit on the Process board.

The preamplifier is a low output impedance and negative feedback amplifier which uses a low noise FET at the input.

To maintain the low noise in the signal, a so-called Percival circuit is used. It improves the S/N ratio at relatively high frequencies (where color components are located).

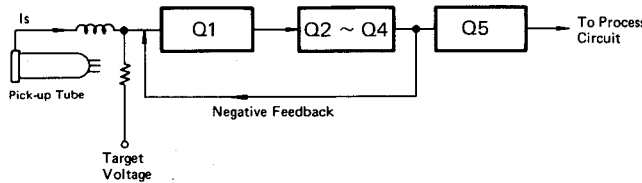


Fig. 2-1 Preamplifier

Details

The signal current from the pick-up tube, comprising the modulated red(R) and blue(B) components, and the green(G) component, is supplied to the target terminal of the Preamplifier circuit and converted to the video signal by R2 through L1 Percival coil. This video signal is amplified approx. 30dB by the amplifier which consists of Q1 FET and Q2. The amplified signal is then fed to Q3 and Q4 which amplify the input signal approx. 66dB.

The signal at the collector of Q4 is negatively fed back to the gate of Q1 through a feedback circuit which consists of R8, R12, C8 and C9.

The CT1 adjusts the frequency response of the feedback signal and corrects the frequency response of video signal.

The video signal whose frequency response is shaped by the negative feedback is converted to the low impedance video signal with the use of buffer Q5. It is then supplied to the Process board.

The target voltage for the pick-up tube is supplied from the Deflection board to terminal No. 4 (TARGET VOLTAGE IN) of the multi-pin connector B11 through the Process board.

The target voltage, controlled due to the pick-up tube temperature drift, is supplied to the pick-up tube target through R17, R1 and L1.

Percival Circuit

The pick-up tube's output is a low noise signal, so that the video S/N is determined by the noise of the preamplifier.

The S/N of the modulated R and B signal is lower than that of the non-modulated signal G in the low frequency range due to effects of the pick-up tube output capacitance and the input capacitance of the preamplifier. Percival circuit is adopted to reduce the effects of these capacitances and improve the S/N.

The beneficial effects of the Percival circuit are shown in Fig. 2-2. The equivalent circuit is also shown in Fig. 2-3.

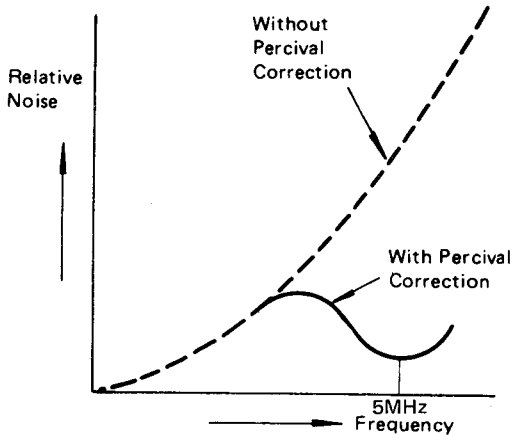


Fig. 2-2 Percival Correction

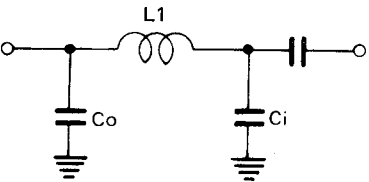


Fig. 2-3

Where : L1 ; Percival coil
Co ; Output capacitance of pick-up tube
Ci ; Input capacitance of preamp

3 Deflection Board

The Deflection Board contains following circuits.

3-1	+7.6V Regulator Circuit	17
3-2	+4.8V Regulator Circuit	18
3-3	+9.4V Regulator Circuit	18
3-4	Microprocessor Power Supply Circuit	19
3-5	Horizontal Deflection Circuit	21
3-6	Horizontal Linearity Correction Circuit	21
3-7	Vertical Deflection Circuit	22
3-8	Target Voltage Setting Circuit	23
3-9	Cathode Blanking/Beam Detect Circuit	24
3-10	Bias Light/Lag Correction Circuit	25
3-11	High Voltage/Feedback Beam Control Circuit	26
3-12	EVF Video Amplifier Circuit	27
3-13	EVF Vertical Deflection Circuit	27
3-14	EVF Horizontal Oscillation Circuit	28
3-15	Standby Circuit	28
3-16	Playback Control Circuit	29

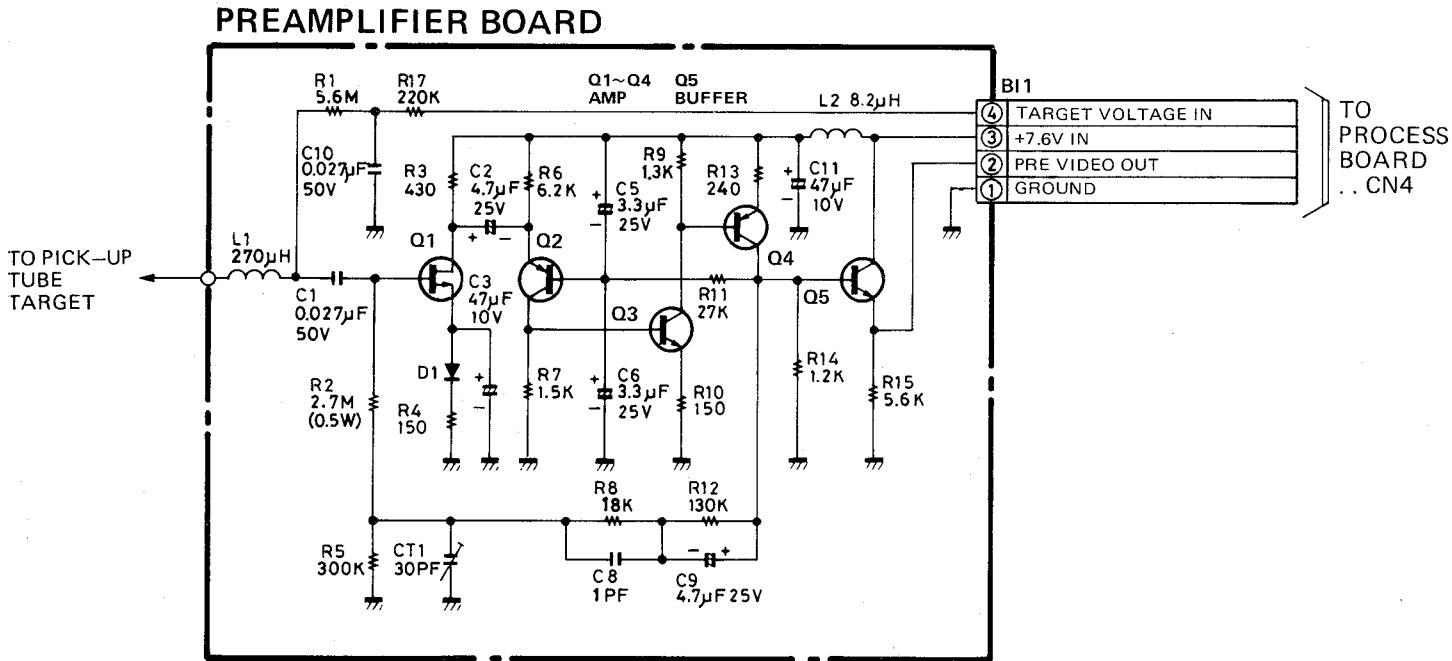


Fig. 2-4 Preamplifier Circuit

3-1 +7.6V Regulator Circuit

Outline

The +7.6V regulator circuit consisting of IC1, Q1, Q2 and Q3 generates regulated +7.6V DC from +12V unregulated DC power from the portable VTR or the power supply unit.

This +7.6V regulator is a switching type regulator and the output voltage is controlled as;

+7.6V --- STANDBY switch is ON position

+5.0V --- STANDBY switch is STANDBY-1 & 2 position
in order to save the battery life.

Details

The +12V DC power from the portable VTR or the power supply is applied through terminal No. 10 of VTR connector CN101 and terminal No. 2 of CN5 to the emitter of Q1 and Pin 1 of IC1 respectively.

+5V DC is generated inside IC1 and used as sub-power inside IC1.

Approx. 120KHz triangular signal is also generated in triangle oscillator (OSC) inside IC1 and fed to the switching amplifier inside IC1.

The reference DC voltage supplied to pin 11 of IC1 whose level is set by VR1 (+7.6V ADJ) and +7.6V output DC supplied to pin 10 of IC1 are compared by the error amplifier inside IC1. The error output DC voltage corresponding to the +7.6V DC voltage error and triangular signal supplied from triangle OSC are compared by the switching amplifier and the switching pulse output whose width is controlled by the error DC voltage appears at pin 9 of IC1.

This switching pulse is applied to the base of switching transistor Q1 switching ON and OFF Q1 through buffer Q2 and Q3.

As a result, the DC voltage whose level is set by the switching pulse width (pulse duty) is obtained at the output of switching regulator circuit consisting of Q1, D1 and L2. The generated DC voltage is fed back to pin 10 of IC1 to maintain constant output voltage. VR1 is a control for +7.6V output voltage.

The regulated +7.6V is then supplied to other circuits as a power through the filters consisting of L2/C6 and L3/C9.

The standby control section inside IC1 sends out either +5V DC voltage during STANDBY switch is ON position or 0V during STANDBY switch is STANDBY-1 & 2 position to pin 7 of IC1 depend upon supplied DC voltage at pin 5 of IC1 which is changed from +7.6V at ON position to 0V at STANDBY-1 and 2 position.

As a result, the +7.6V DC voltage drops to +5.0V by dropping reference voltage at pin 11 of IC1.

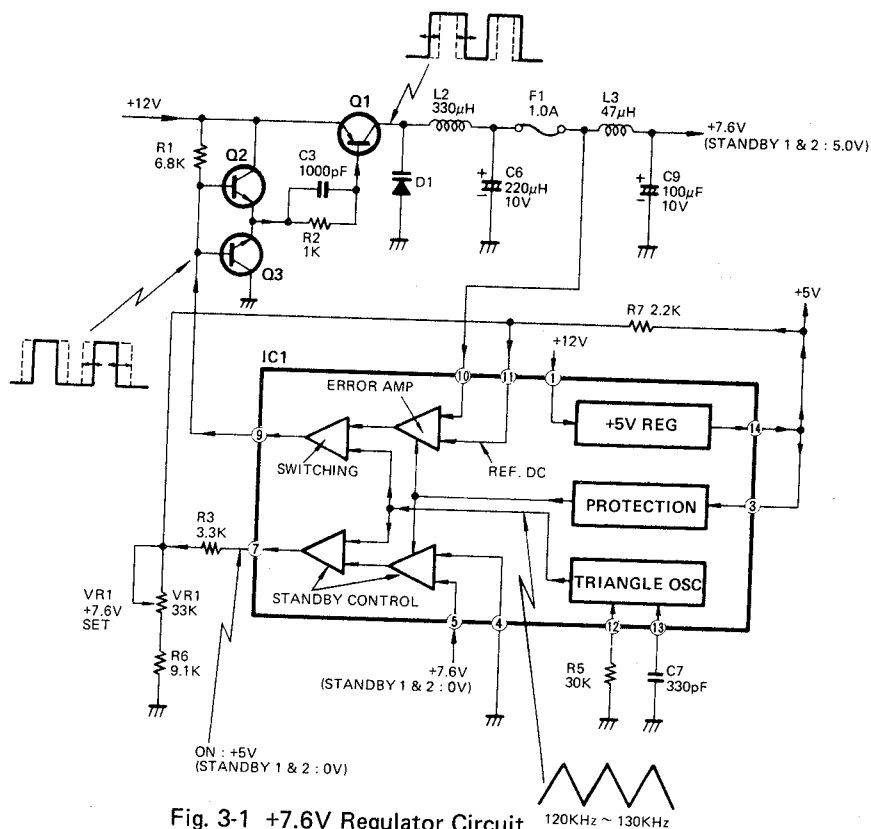


Fig. 3-1 +7.6V Regulator Circuit

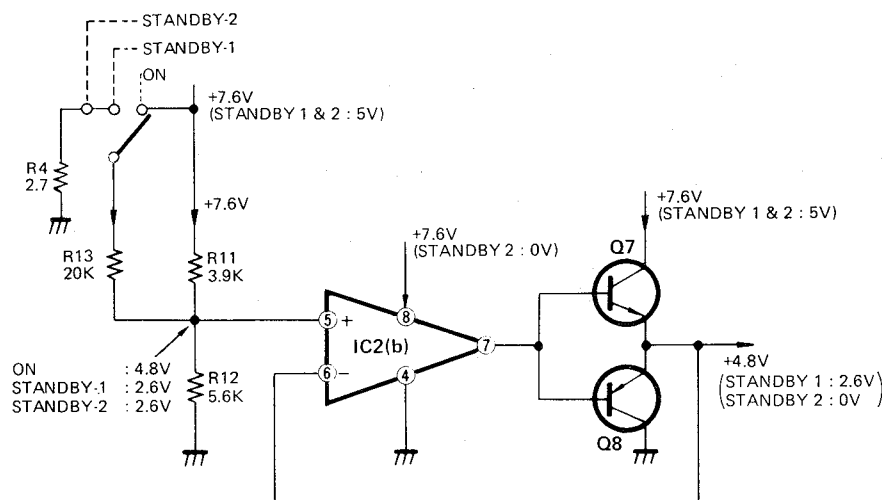


Fig. 3-2 +4.8V Regulator Circuit

3-2 +4.8V Regulator Circuit

Outline

+4.8V DC is generated by regulating +7.6V generated in the +7.6V regulator circuit.

This +4.8V is used as power supply for other circuits. This +4.8V DC voltage also drops to either +2.6V at STANDBY-1 or 0V at STANDBY-2 for saving battery life.

Details

The +4.8V DC voltage is generated by regulating +7.6V DC power using IC2(b), Q7 and Q8.

The output voltage of Q7/Q8 is applied to pin 6 of IC2 to form a feedback loop, and thus stabilizing the output voltage. The reference voltage for pin 5 of IC2 is obtained by dividing the +7.6V using R11 and R12.

However the reference voltage drops at STANDBY-1 & 2 position caused by dropping +7.6V DC. Also power supply for IC2 (pin 8) becomes 0V at STANDBY-2 position.

As a result, +4.8V DC drops to either +2.6V at STANDBY-1 or 0V at STANDBY-2.

3-3 +9.4V Regulator Circuit

Outline

+9.4V DC voltage is generated from unregulated +12V DC power by IC4(b) and Q9 and this +9.4V is used as power supply for other circuits.

The +9.4V DC also drops to 0V at STANDBY-1 & 2.

Details

The +9.4V DC voltage is produced by IC4(b) and Q9 and obtained at the collector of Q9.

The output voltage is fed back to pin 5 of IC4 by dividing the +9.4V DC voltage using R14 and R15 for stabilizing the +9.4V DC output voltage. Also +4.8V regulated DC is supplied to pin 6 of IC4 for the reference voltage.

However, the +4.8V DC voltage is changed to 0V at STANDBY-1 & 2. Therefore +9.4V DC voltage is also changed to 0V at STANDBY-1 & 2.

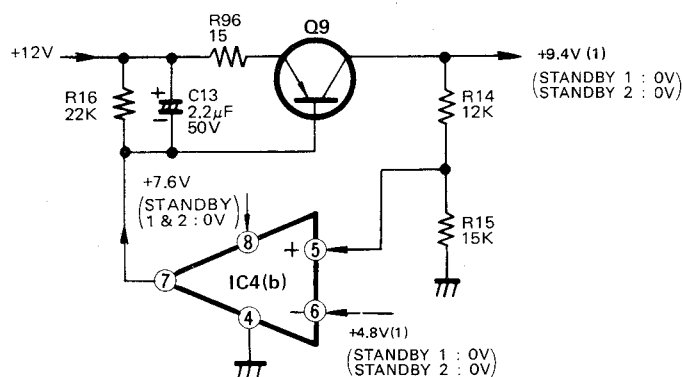


Fig. 3-3 +9.4V Regulator Circuit

3-4 Micro Processor Power Supply Circuit

Outline

This circuit consisting of Q5 and Q6 produces +5V DC voltage at the STANDBY switch is ON, +4.3V at STANDBY-1 & 2 for the power supply of the micro-processor. Also, the back-up battery DC-DC converter circuit consisting of Q12, Q13 and Q40 generates approx. +3.4V DC voltage from +1.5V dry battery which called back-up battery and supplies it to the micro processor as a power source in order to maintain the calendar function of the microprocessor during no +12V DC power is supplied.

The CPU reset pulse generator Q11 generates a reset pulse for the microprocessor and the back-up battery warning circuit IC4(a) produces the back-up battery warning signal and sends it to microprocessor board in order to indicate the back-up battery level which becomes too low.

When the new (full charged) +1.5V back-up battery is installed, the back-up battery DC-DC converter circuit may be worked up to approx. 1 year.

Details

When the STANDBY SW is placed ON position, +7.6V DC voltage is applied to the collector of Q6, +5V DC voltage is sent to the base of Q5 and +4.8V DC voltage is fed to the collector of Q5 and Q5 & Q6 turn ON. Therefore, +5V DC voltage obtained at the emitter of Q6 is sent to the micro processor as a power source. However, +7.6V DC drops to +5V when the STANDBY SW is placed STANDBY-1 & 2 and +4.8V DC drops to +2.6V at STANDBY-1 and 0V at STANDBY-2. As a result, +5V DC obtained at the emitter of Q6 drops to +4.3V at STANDBY-1 & 2.

When the +12V DC power from the VTR or power supply unit is turned OFF, the back-up battery DC-DC converter oscillates approx. 200 - 300KHz by Q13, C15, R21, T2 and the stray capacitance using +1.5V dry battery and boosts it by T2.

The boosted switching pulse obtained at pin 2 of T2 is rectified by D3 and converted it to +3.4V DC by C10. This +3.4V DC is supplied to the microprocessor to maintain its calendar function during no +12V DC power is supplied.

However, the +3.4V DC voltage drifts according to the 1.5V back-up battery voltage. Therefore the voltage regulator Q12, D2, R20 and R91 controls the base bias voltage of Q13 to control the ON/OFF duty of Q13 to keep +3.4V DC voltage constant.

On the other hand, when +12V DC is supplied to the camera, +5V or +4.3V DC is fed to D2 from the emitter of Q6 and D2 & Q12 are turned ON. The base of Q13 is connected to ground by Q12, Q13 is turned OFF and oscillation is stopped.

But, when no +12V DC is supplied to camera and +1.5V back-up battery is completely discharged, the new +1.5V back-up battery is then installed, approx. 5 - 10 times more current flow to the microprocessor compare to normal back-up mode due to the microprocessor's characteristic. This case, the back-up battery DC-DC converter circuit can not supply the +3.4V DC to the microprocessor because of small capacity of output current. Therefore, the base of Q40 is low and Q40 is turned OFF to stop the oscillation by cutting off the base bias voltage of Q13.

The Q11 generates the CPU reset pulse when the back-up battery is replaced and +12V DC power is then supplied to the camera. This case, the microprocessor is reset by the CPU reset pulse. All information such as calendar, title 1, 2 and 3, automatic white balance (AWC) level etc. is cleared.

IC4(a) compares the +1.5V back-up battery voltage and the reference voltage divided +7.6V using R22 and R23. When the back-up battery voltage is higher than 1.1V, the output voltage at pin 1 of IC4 is low(L) and this is sent to microprocessor board as the information of which the battery level is OK. But the back-up battery is discharged and its voltage becomes lower than 1.1V, the output of IC4 changes high(H) and this is sent to microprocessor board for blinking the tape counter on the electronic viewfinder (EVF).

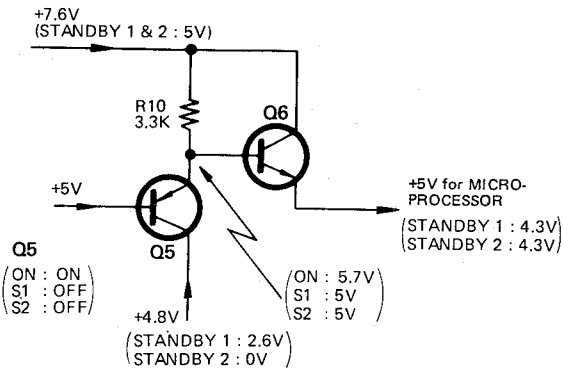


Fig. 3-4-1 Power Supply for Microprocessor

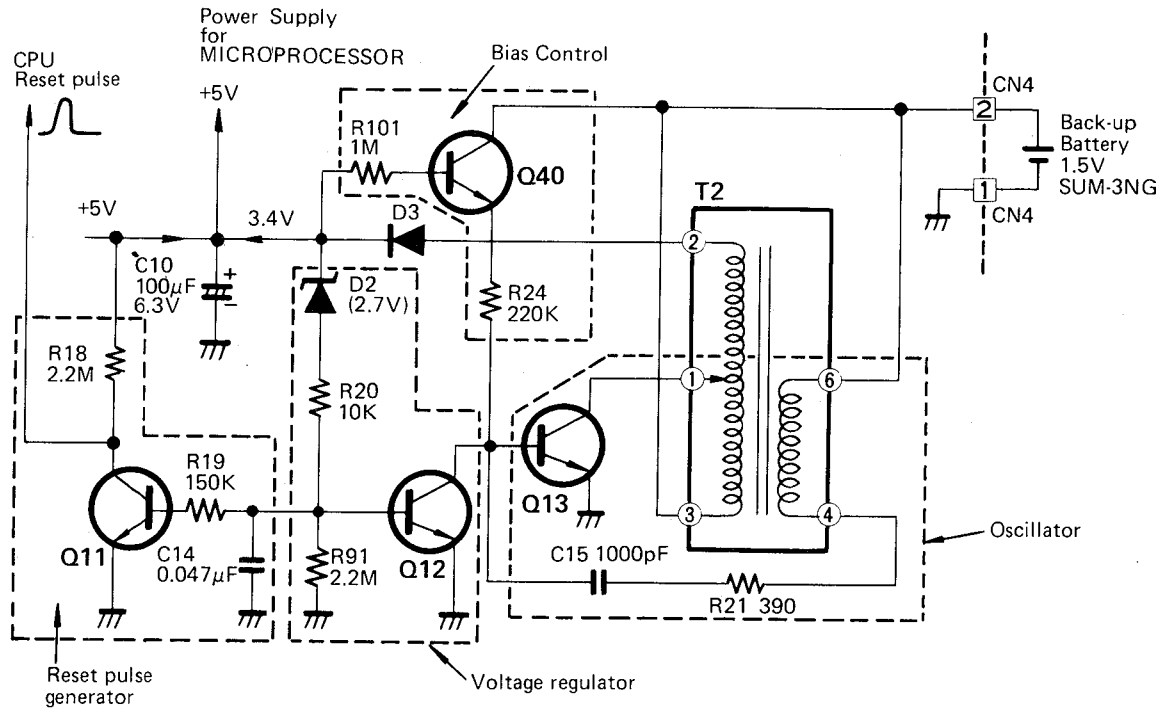


Fig. 3-4-2 Back-up Battery DC-DC Converter Circuit

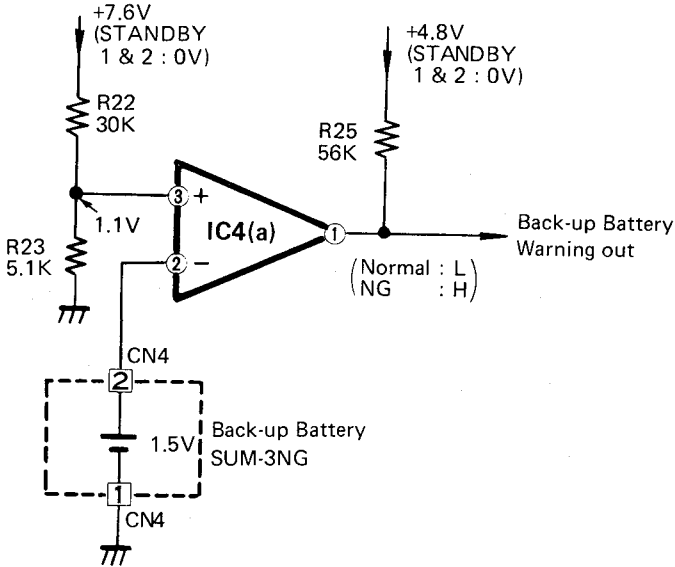


Fig. 3-4-3 Back-up Battery Warning Circuit

3-5 Horizontal Deflection Circuit

Outline

This circuit generates the sawtooth current for the horizontal(H) beam deflection inside the pick-up tube, supplying it to the pick-up tube H. deflection coil.

Details

The horizontal scanning start(Hs) pulse supplied from the Process board goes via inverter Q15 to horizontal deflection output Q16. When Q16 is switched ON by the Hs pulse from Q15, the collector current pulse at Q16 resonates with L4 and C20, and the resultant horizontal sawtooth current is generated and supplied to the pick-up tube horizontal deflection coil through terminal No. 2 of CN3.

VR2 (H. SIZE) is a control for adjusting the horizontal scanning size.

3-6 Horizontal Linearity Correction Circuit

Outline

The horizontal (H) deflection circuit is of a switching type, so that the generated sawtooth current waveform has poor linearity.

By feeding the sawtooth current to the deflection coil, the intensity of the magnetic field generated in the deflection coil is not linear as the pick-up tube's electron beam is deflected.

If a linear sawtooth current (A) is sent to the deflection coil, however, the magnetic field in the scanning start portion is distorted (B) due to the effect of the pick-up tube's electrodes, coil hysteresis, etc. As a result, the linearity of the scanning start portion deteriorates, and a shading (unevenness of amplitude) appears on the left edge of the picture.

Therefore, in order to generate a linear magnetic field intensity (D) and to correct the linearity and shading of the scanning start portion, it is necessary to feed a nonlinear sawtooth signal (C) to the deflection coil. This circuit generates a waveform to correct the linearity of horizontal sawtooth current waveform and its starting portion.

The horizontal deflection circuit is connected to one end of the horizontal deflection coil, and the horizontal linearity correction circuit to the other end.

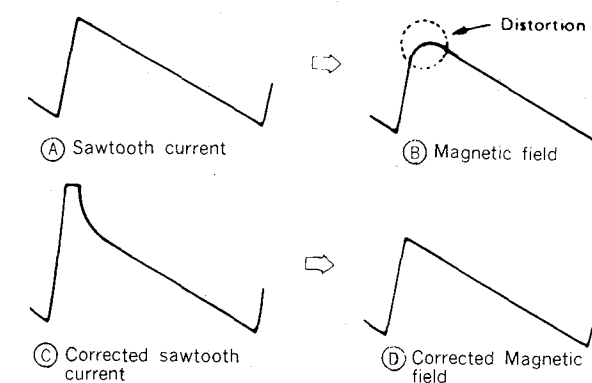


Fig. 3-6-1 Horizontal Linearity Correction-1

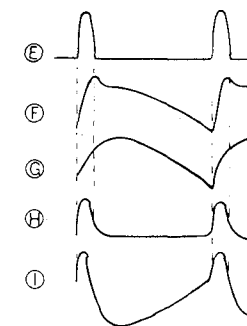


Fig. 3-6-2 Horizontal Linearity Correction-2

Details

The horizontal H pulse (E) produced from the collector of Q16 in the H. deflection circuit is integrated by VL5 and R33 into a sawtooth signal (F).

This sawtooth signal is again integrated by VL5, R32 and C19 into a parabola signal (G), which is applied through R34 to pin 2 of differential amplifier IC2 (a) as a H. linearity correction signal.

The H. pulse (E) from Q16 is integrated by R36 and C21 into a linearity correction signal (H) for correcting the linearity of the starting portion of the horizontal sawtooth current waveform. The starting portion linearity correction signal (H) is applied to pin 3 of IC2 where the linearity correction signal (G) and the starting portion linearity correction signal (H) are mixed and amplified. The mixed signal (I) of these linearity correction signals at pin 1 of IC2 is fed to the H. deflection coil to correct the linearity of the horizontal sawtooth current waveform.

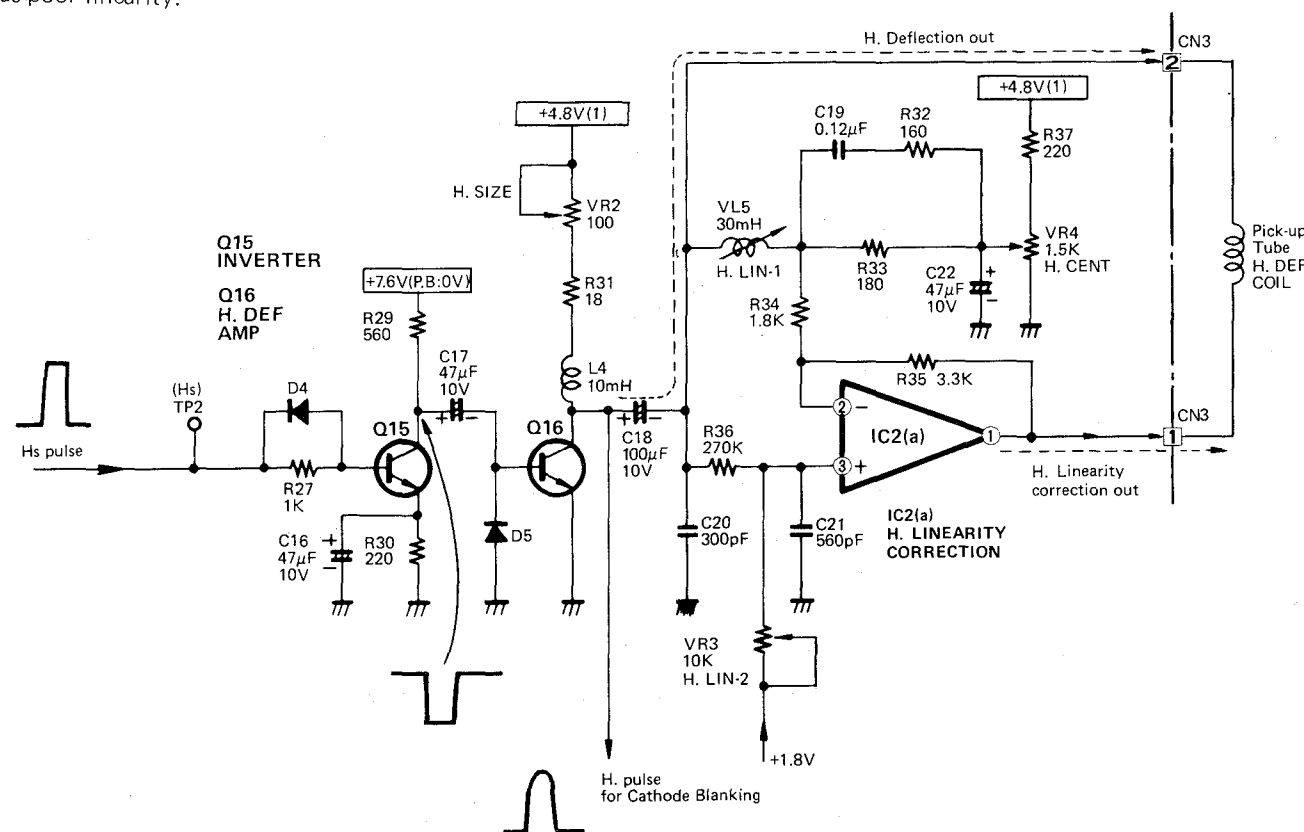


Fig. 3-5 Horizontal Deflection Circuit

VL5 (H. LIN-1) is a control for adjusting the overall linearity of sawtooth current.

VR3 (H. LIN-2) is a control for adjusting the linearity of the starting portion.

VR4 (H. CENTERING) is a centering control which controls the negative input potential of IC2 to change the direct current flowing to the H. deflection coil, and thus sets the horizontal scanning position on the pick-up tube.

3-7 Vertical Deflection Circuit

Outline

This circuit generates a sawtooth current for the vertical(V) beam deflection inside the pick-up tube, feeding it to the pick-up tube V. deflection coil.

Details

The vertical scanning start(Vs) pulse sent from the Process board is fed to sawtooth generator Q17 through buffer Q14 which converts it into a vertical rate sawtooth.

This sawtooth signal is applied to pin 2 of amplifier IC3, which produces an amplified vertical sawtooth signal from its output pin 1. This amplified signal is sent to the pick-up tube vertical deflection coil.

The sawtooth current flowing to the vertical deflection coil is detected by R45 which is connected in series with the deflection coil, and fed back to sawtooth generator Q17, thus correcting the linearity of the vertical sawtooth waveform. Therefore, a linear sawtooth current flows into the pick-up tube vertical deflection coil. VR5 (V.SIZE) is the control for the amplitude of the vertical deflection sawtooth waveform to set vertical scanning size.

VR6 (V. CENTERING) is a centering control which controls the direct current flowing to the vertical deflection coil through buffer IC3(b) to set the vertical scanning position on the pick-up tube.

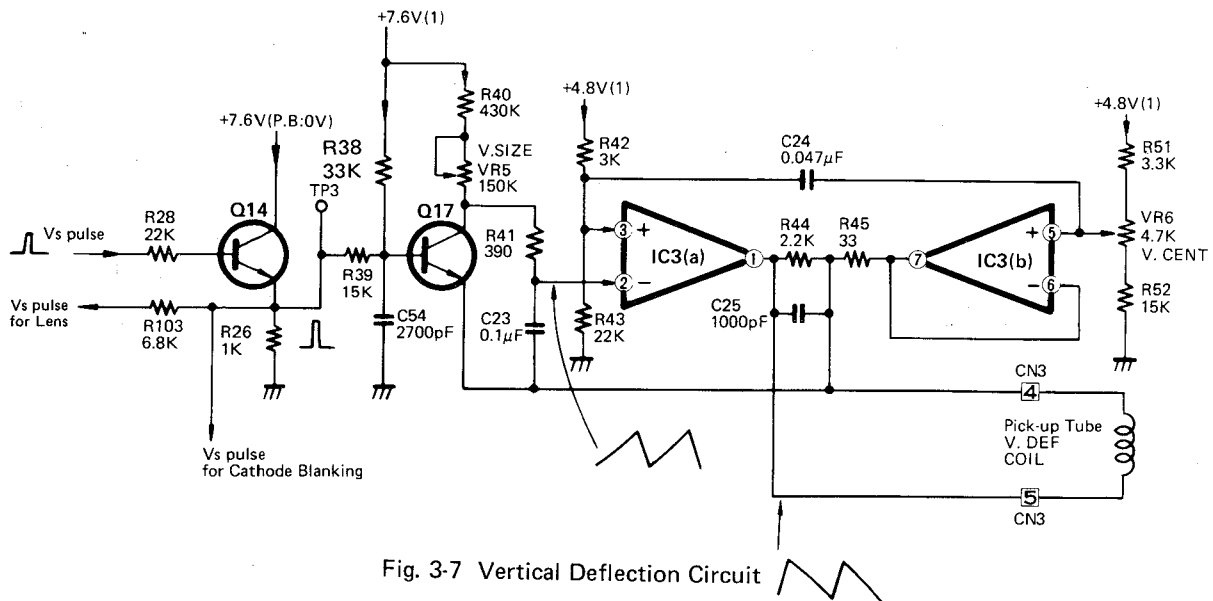


Fig. 3-7 Vertical Deflection Circuit

3-8 Target Voltage Control Circuit

Outline

Each pick-up tube has optimum target voltage to produce the best performance. The optimum target voltage for the Newvicon[®] varies according to the Newvicon[®] temperature.

The target voltage control circuit detects the Newvicon[®]'s temperature variation, and controls the target voltage according to the temperature drift to meet the optimum target voltage.

If the temperature goes up, the resistance of the thermistor decreases so that the total resistance connected between the collector of Q22 and ground decreases. Accordingly, the collector potential of Q22 falls, and the target voltage which is set by VR10 is reduced. In this way, the target voltage is kept optimum according to temperature variations.

When the temperature falls, the reverse operation takes place.

The target voltage applied to the Newvicon[®] is set by VR10 (TARGET).

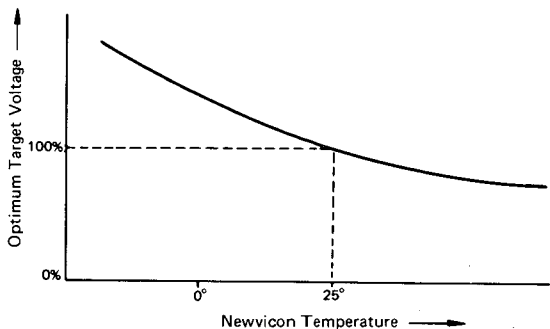


Fig. 3-8-1 Optimum Target Voltage of Newvicon[®]

Details

The deflection coil assembly has a built-in temperature detecting thermistor which is connected between terminal No. 3 of CN3 and ground.

When the inside temperature of the deflection coil assembly changes (it also changes in the Newvicon[®]) the thermistor resistance, the collector current of DC amplifier Q22 is changed and this changes the collector voltage of Q22.

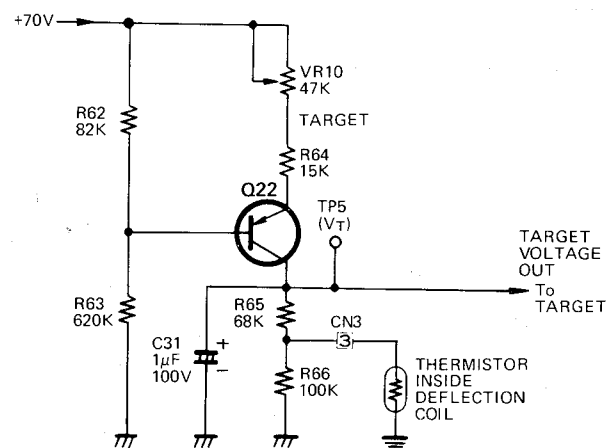


Fig. 3-8-2 Target Voltage Control Circuit

3-9 Cathode Blanking/Beam Detect Circuit

Cathode Blanking Circuit

Outline

This circuit generates a cathode blanking pulse and supplies it to the pick-up tube cathode(K) in order to eliminate the retrace scanning lines.

Details

The horizontal(H) pulse at the collector of H.deflection output Q16 and the vertical scanning start (Vs) pulse from the Process board through inverter Q18 and Q19 are supplied to base of the switching amplifier Q20 respectively.

The mixed signal obtained at the emitter of Q20 is supplied to the cathode(K) of pick-up tube through terminal No. 4 of B11 as a cathode blanking pulse.

Beam Detect Circuit

Outline

This circuit detect the current flow from the pick-up tube cathode (K) and generate the control signal. This control signal is then fed to the Audio/Lens Control board to control the automatic iris control (AIC) lens and automatic white balance control (AWC) circuit in Microprocessor board.

Details

When the power switch is initially turned ON, it takes some times for cathode of the pick-up tube to be heated sufficiently in order to emit electrons at full force. Therefore, during initial period of the time after turn ON the power switch, no current flow from the cathode (K) of the pick-up tube to Q20 and no DC bias apply to the base of Q21 thus Q21 stays OFF and potential at the collector of Q21 stays high(H).

This high potential at the collector of Q21 is fed to the Audio/Lens Control board to set the automatic iris control (AIC) lens to close iris position in order to protect the pick-up tube from the burning. (Refer to Automatic Iris Control circuit in Audio/Lens Control board.)

Also this high potential supplied to the Microprocessor board inhibits the automatic white balance control (AWC) circuit in the Microprocessor. (Refer to Auto White Balance Control circuit in Microprocessor board.)

After the pick-up tube warm up, current flows from the cathode normally then DC bias obtained at the base of Q21 to turn Q21 ON and potential at the collector of Q21 becomes low (L).

This low potential is supplied to the Microprocessor board to operate AWC circuit normally and the Audio/- Lens Control board to operate AIC lens.

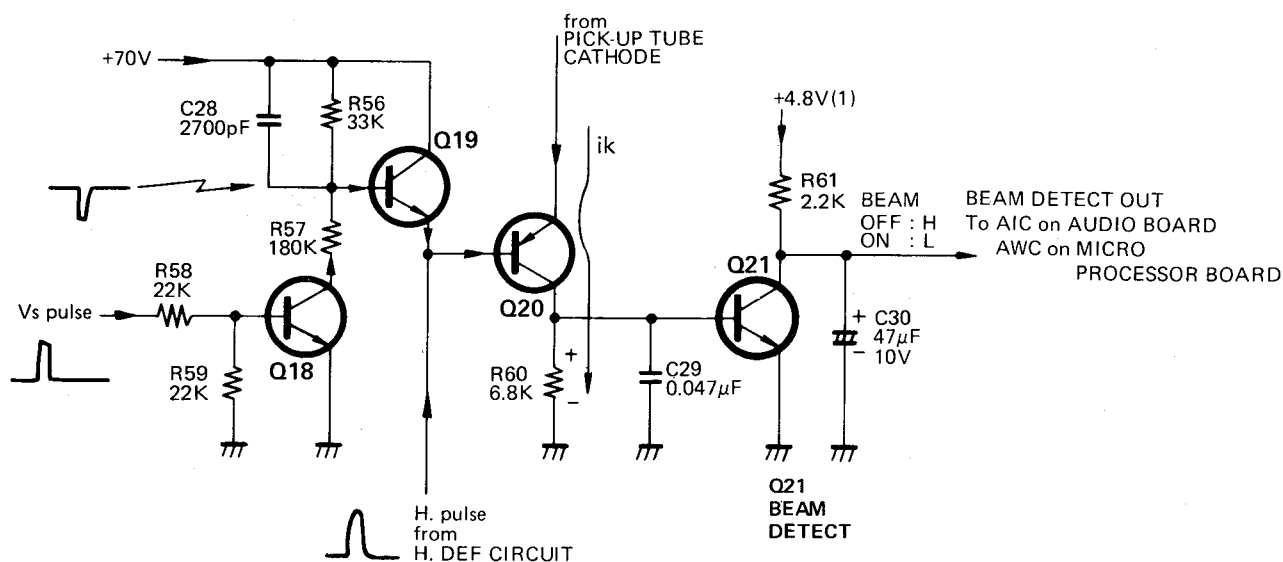


Fig. 3-9 Cathode Blanking and Beam Detect Circuit

3-10 Bias Light/Lag Correction Circuit

Bias Light Circuit

Outline

The pick-up tube produces dark current when the light is blocked by capping the lens for example. The dark current of Newvicon® is extremely small comparing with vidicon. Therefore, when the camera is aimed at the dark scene, potential at the photoconductive(target) layer of Newvicon® becomes lower than that of vidicon and the electron beam becomes insufficient to discharge the target. As a result, the beam does not respond to the variation of incoming light intensity to the Newvicon® and lag increases. (When a moving object is shot, or when the camera is panned, a trailing image is exhibited. This trailing image is called lag.) In order to minimize the lag, bias light LEDs are positioned at the rear portion of pick-up tube for increasing the light intensity of the Newvicon®.

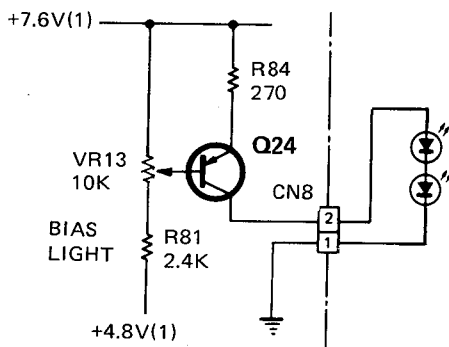


Fig. 3-10-1 Bias Light Circuit

Details

The DC current adjusted by VR13(BIAS LIGHT) flows into bias light LEDs in the bias light assembly through Q24 and pin 2 of CN8 to light them in order to keep the light intensity of the pick-up tube to certain level. VR13 adjusts the brightness of LEDs.

Lag Correction Circuit

Outline

In order to minimize the lag, prevideo signal supplied from process board is applied to cathode of pick-up tube in order to rise the potential of photoconductive layer relatively by positive feedback the lag correction signal to cathode.

Details

The prevideo signal fed from process board is fed to the base and collector of white suppressor Q30 and the white suppressed prevideo signal is amplified and inverted by Q31. The amplified video signal is then mixed with cathode blanking signal and supplied to cathode through D7 and Q20.

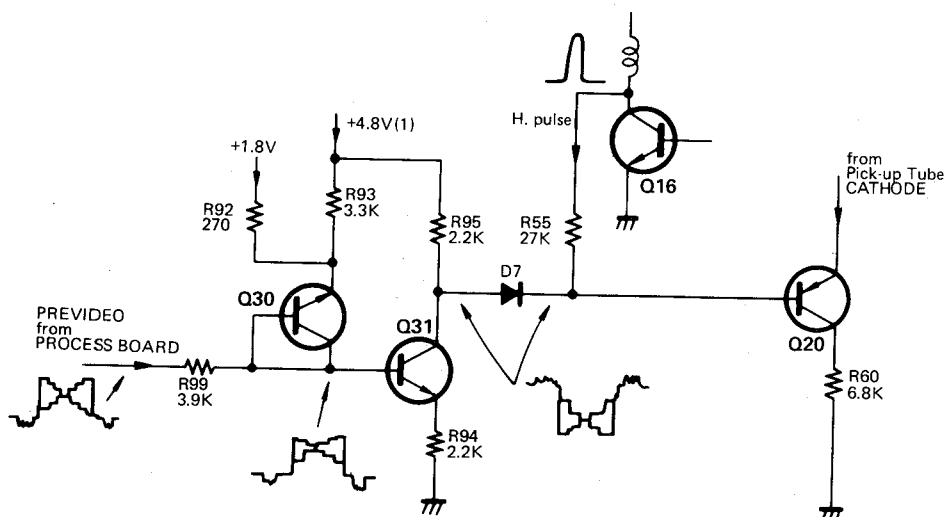


Fig. 3-10-2 Lag Correction Circuit

3-11 High Voltage/Feedback Beam Control Circuit

High Voltage Circuit

Outline

This circuit generates high voltages needed for the pick-up tube.

Details

The pre-blanking(PRE BL) pulse generated in the SYNC-1 board is supplied to the primary winding of step-up transformer in high voltage pack T1 through inverter Q26 and driver Q27 to step up the PRE-BL pulse to necessary level.

The boosted pulses obtained at the secondary winding of step-up transformer are rectified to generate high voltages.

The high voltages are derived as follows.

The -70V obtained at pin 2 of T1 is fed to grid-1(G1) through Q28. VR14(BEAM) is a control for the beam amount of pick-up tube.

The +350V at Pin 5 of T1 is applied to grid-2(G2) directly.

The +1.5kV obtained at pin 4 of T1 is supplied to grid-6(G6).

The voltages for grid-4(G4) and grid-5(G5) are obtained by dividing +1.5kV by block resistor Z1 and VR15-(FOCUS) in Z1.

The +70V obtained at pin 1 of T1 is fed to cathode blanking circuit and target voltage control circuit.

Feedback Beam Control Circuit

Outline

The beam current adjustment is made so that there is sufficient beam current and it is to discharge the target for most intense highlights to be expected. Thus, beam current is set with a lens opening that admits three times as much light as found under the standard lighting condition. This is called the 3X beam setting.

Excessive beam current results in electron spacecharge effects near the target that acts to destroy focus and cause geometric distortion of the scanned area.

In normal camera operations, specular highlights do show up that requires more beam current than that provided by the 3X setting. These high lights occur when the camera pans across lighting fixtures, outdoor lights, auto headlights, highly polished jewelry or musical instruments. The effect of such of moving objects is a white comet tail that streams out to the left if the camera is panning to the right. The reason for this tail is that subsequent scans, after the highlight has moved off its original spot, are required to discharge the target. The more scans required to discharge the target when the longer the tail becomes.

The solution to comet-tailing is automatic beam control, which supplies extra beam current to meet the demands of those extraordinary highlights. To do this, the video signal from preamplifier is fed back to grid-1(G1) to boost pick-up tube beam current just for the duration of the highlight.

Details

The feedback beam control circuit consisting of Q32 and Q33 control the grid-1(G1) voltage using the prevideo signal fed back from Process board.

The prevideo signal fed from Process board is supplied to the emitter of Q32, but when a normal object is shot, the bias voltage for Q32 is set so that no video signal appears at the collector of Q32. When the excessive bright object is shot, the video signal corresponding to the bright object is obtained at the collector of Q32 to turn ON Q33. The potential of grid-1 becomes nearly 0V by Q33 so that extra beam current flows to minimize comet-tailing.

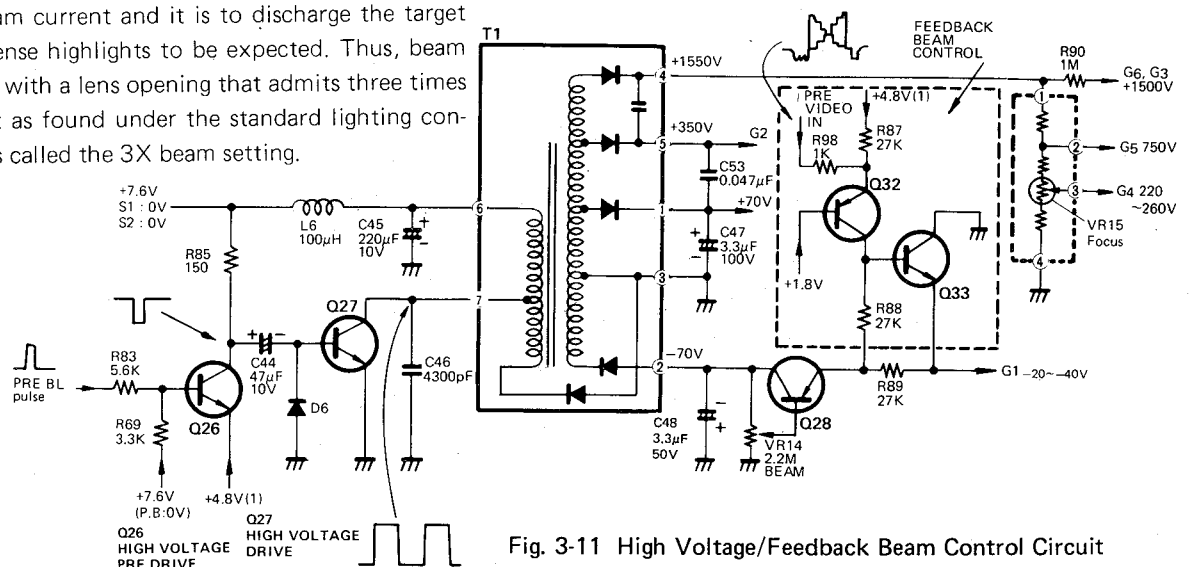


Fig. 3-11 High Voltage/Feedback Beam Control Circuit

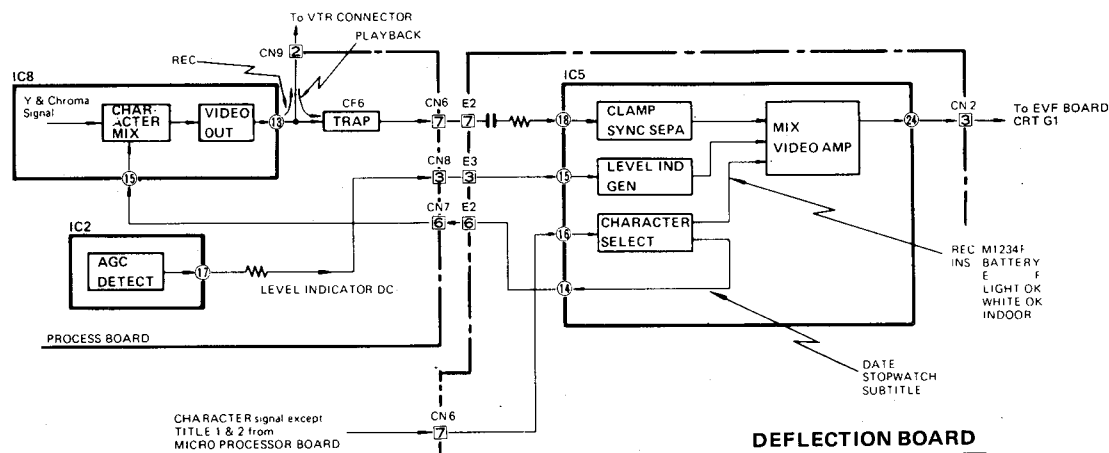


Fig. 3-12 EVF Video Amplifier Circuit

3-12 EVF Video Amplifier Circuit

Outline

This circuit amplifies the video signal supplied from the Process board and feeds it to the cathode ray tube(CRT) together with the level indicator signal which indicates the video level and character signal which generated in the Microprocessor board for graphics display on the CRT screen.

Details

The PAL signal from the Process board is applied to pin 18 of IC5 through trap CF6 which located on the Process board for removing the chrominance components in the PAL signal. The video signal is clamped and amplified at inside IC5 then mixed with level indicator signal and character signal.

The mixed signal obtained at pin 24 of IC5 is supplied to grid-1(G1) of the CRT through VR3(CONTRAST) and amplifier Q2 in the Viewfinder board.

3-13 EVF Vertical Deflection Circuit

Outline

This circuit generates vertical deflection sawtooth current for vertical scanning of beam inside the cathode ray tube(CRT).

Details

The video signal from the Process board is supplied to the sync separator in IC5 through pin 18 of IC5.

The sync separator in IC5 detects only sync pulse of video signal and V. sync pulse is made.

The vertical(V) sync pulse generated in the sync separation circuit is fed to V. oscillator (V.OSC) inside IC5 as a trigger pulse. The V. OSC is a free-running sawtooth generator whose frequency is approximately 45Hz. When the trigger pulse is supplied to the V.OSC circuit, it generates a 50Hz sawtooth signal.

The V. sync pulse obtained at pin 13 of IC5 is supplied to Microprocessor board.

The V. sawtooth signal obtained at pin 7 is fed to amplifier through pin 6 of IC5, where it is amplified. The amplified V. sawtooth signal at pin 5 of IC5 is fed to the CRT V. deflection coil through terminal No. 5 of CN2.

VR11 (EVF V.SIZE) is a control for vertical scanning size.

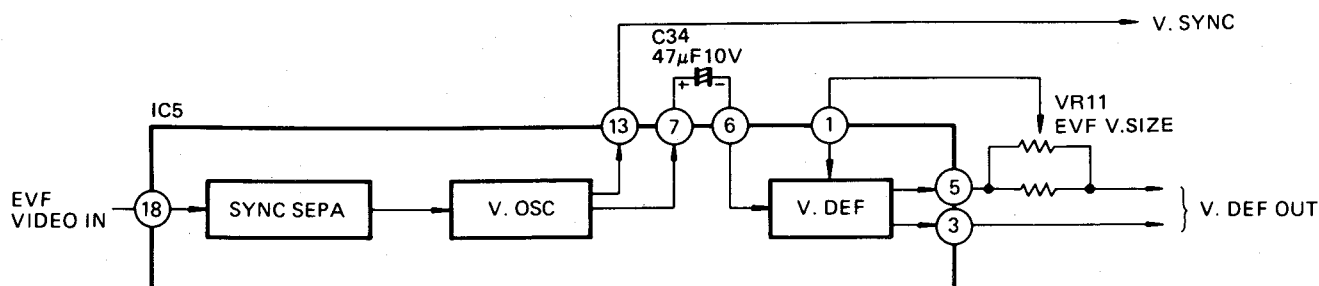


Fig. 3-13 EVF V. Deflection Circuit

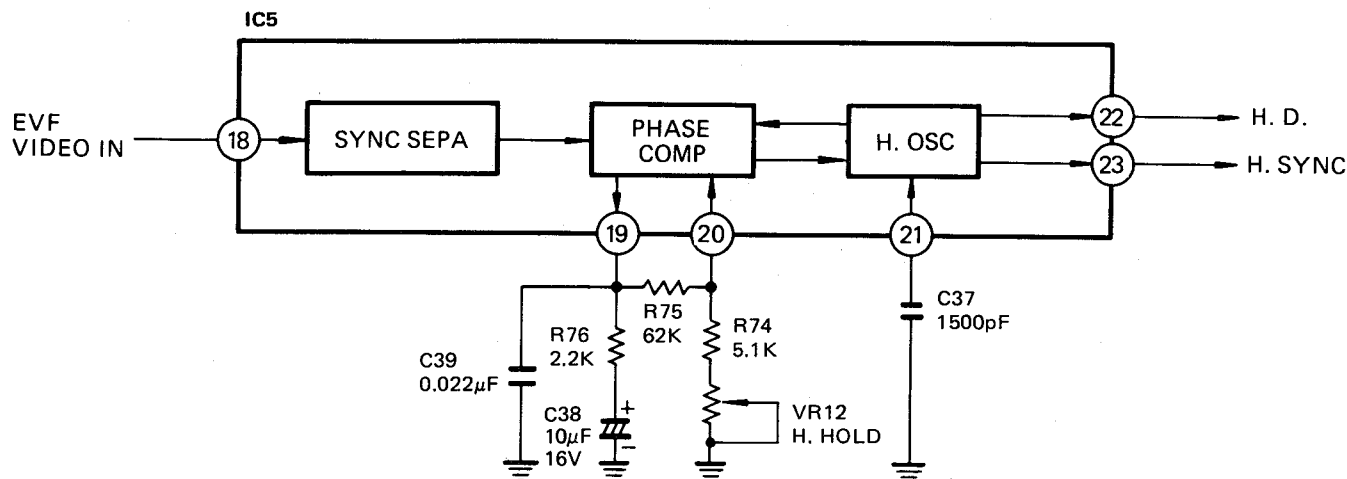


Fig. 3-14 EVF H. Oscillation Circuit

3-14 EVF H. Oscillation Circuit

Outline

This circuit controls the frequency (phase) of the horizontal sawtooth current to correspond to that of horizontal(H) sync pulse separated from video signal.

Details

The horizontal(H) sync pulse from the sync separator is applied to phase comparator inside IC5. The H. oscillation signal from the H. oscillator (H. OSC) circuit inside IC5 also is fed to phase comparator and they are compared with the H. sync pulse in phase. The DC voltage corresponding to the phase difference is fed to H. OSC to control its oscillation frequency. In this way, the H. OSC is automatically controlled to match its oscillation frequency with that of sync pulse. VR12(H.HOLD) is a control for setting the oscillation frequency in a steady state.

The H. sync pulse obtained at pin 23 is supplied to Microprocessor board.

The frequency controlled H. drive (H.D) pulse obtained at pin 22 of IC5 is then fed to the EVF board through terminal No. 4 of CN2 to generate H. deflection sawtooth current.

3-15 Standby Circuit

Outline

When recording outdoors, using camera and VTR, the power reserve of the battery must be conserved as much as possible, which is the exact function of the standby circuit.

Details

When the standby switch SW1 on the Standby board is set to ON position, practically all circuits in the camera and the VTR are operational, that is, the power sources are supplied to all electric circuits in the Deflection, Process, Microprocessor, Sync-1, Sync-2, Lens and Viewfinder boards in the camera and +12V is consumed in the VTR. When the standby switch SW1 on the right side of the camera is set to STANDBY 1 position, +7.6V power source goes only to the heater of pick-up tube and cathode ray tube (CRT). At the same time a standby signal (approx. +3V) generated in Audio/Lens board is supplied to the portable VTR through pin 5 of VTR cable to set the VTR to standby position. +5V DC power is also applied to microprocessor to maintain the all microprocessor functions.

When the standby switch is set to STANDBY-2 position, +5V DC power is only supplied to microprocessor. All circuit except microprocessor are shut off in STANDBY-2 condition.

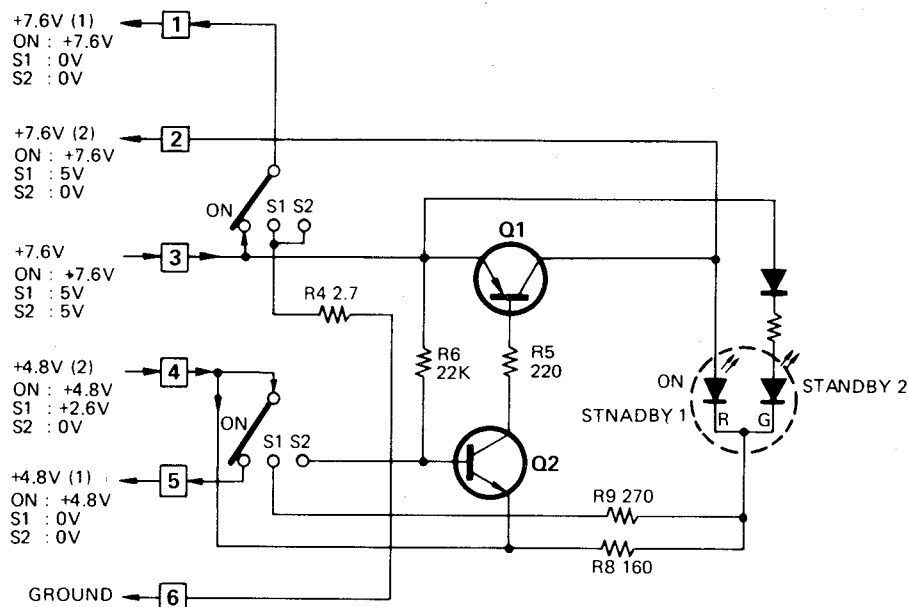


Fig. 3-15 Standby Circuit

3-16 Playback Control Circuit

Outline

This circuit sense the recording or playback of the portable VTR.

When the portable VTR is set into the playback mode, this circuit shuts off horizontal(H) and vertical(V) deflection and high voltage circuits and the playback signal from the VTR is supplied to the viewfinder. When the portable VTR is set into the recording mode, this circuit sets the all circuits in the camera to operating condition and PAL output signal is supplied to the viewfinder and the portable VTR for recording.

Details

When the portable VTR is set into the recording mode, no DC bias is applied to the emitter of Q25 and Q25 remains ON, and Q4 & Q29 are also ON so that +7.6V at the collector of Q29 is supplied to the H and V deflection, Audio/Lens Control board and high voltage circuit to function these circuits normally.

When the portable VTR is set into the playback mode, the playback signal which rides on top of +6V DC is supplied from the VTR to the playback detect circuit on Process board. +4.8V DC generated at playback board for cutting off high voltages generation and closing lens iris. In this way, the PAL signal is not generated in the camera and the playback signal from the portable VTR is supplied to the viewfinder.

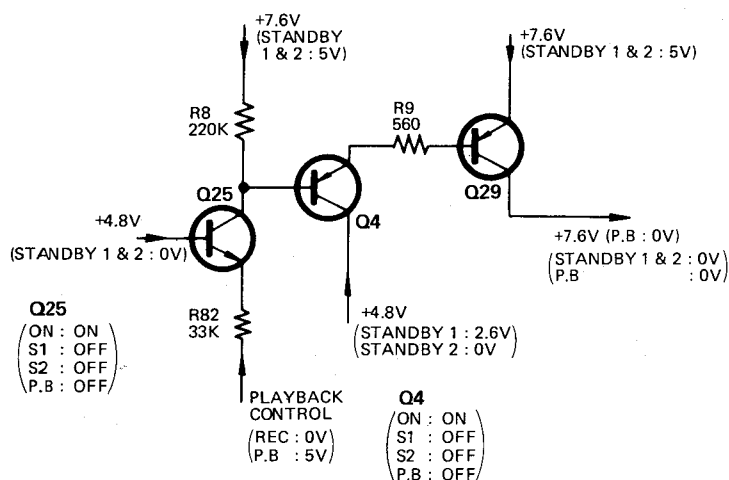


Fig. 3-16 Playback Control Circuit

4 Process Board

The Process Board contains following circuits.

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4-1 Pulse Generator Circuit

Outline

This circuit generates sync pulses used in the camera.

Details

The PRE BL pulse A is mixed with the clamp pulse-1 (CP1) B and wide BL pulse (W.BL) C through R4002, ~ R4004 and R4005. The PRE BL pulse A is also mixed with the blanking (BL) pulse E and the clamp pulse-2 (CP2) F comes from pin 4 of IC13. The multiplied signals D and G thus made are supplied to other circuit. The Hs pulse H is fed to the Deflection board through pin 3 of IC13.

The CP2 is mixed with the PRE BL pulse A and the BL pulse as previously explained.

The wide BL (W.BL) pulse is fed to other circuit through IC13.

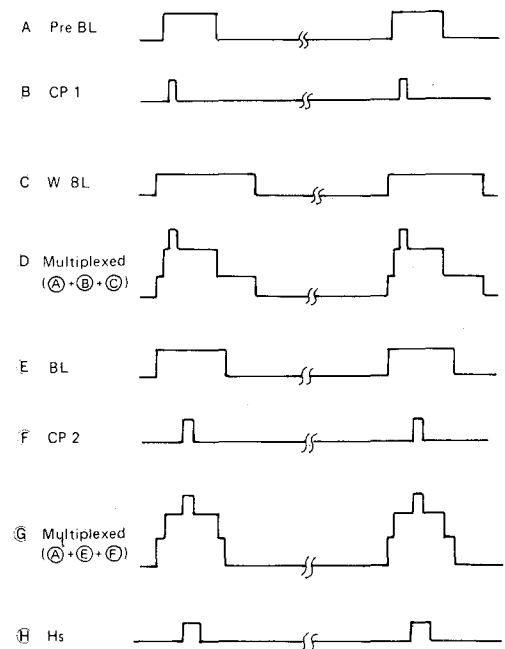


Fig. 4-1-2 Mixed Signals

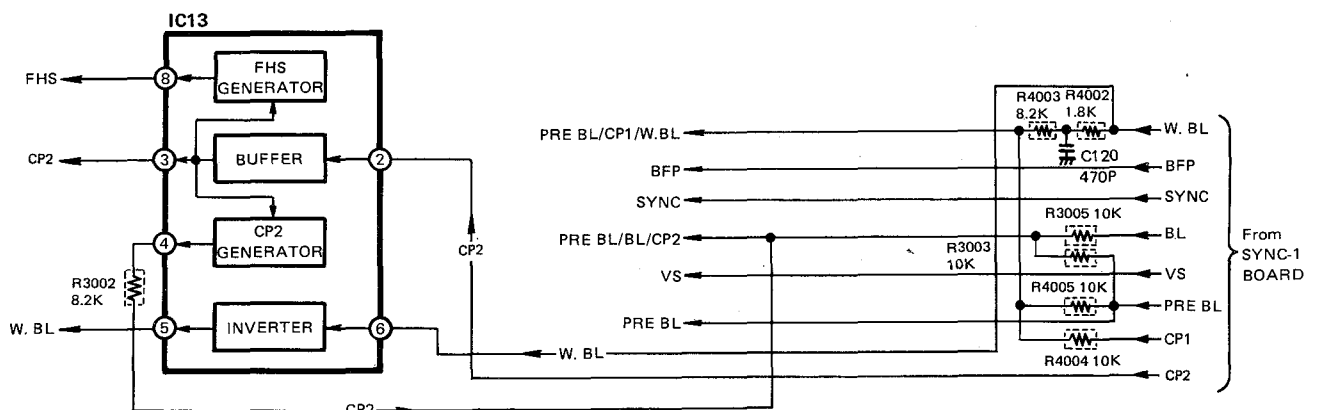


Fig. 4-1-1 Pulse Generator Circuit

4-2 Signal Processing Circuit

This circuit contains the bias light shading correction circuit, optical black clamp circuit, gamma correction circuit, automatic iris control detection circuit and automatic gain control circuit.

4-2-1 Bias Light Shading Correction Circuit

Outline

The bias light LEDs are located on near side of the pick-up tube for minimizing the lag by increasing the light intensity reaches the pick-up tube as described in Deflection board. But the light intensity from the bias light LEDs are not uniform in actual scanning area. The bias light shading correction circuit equalizes the output of the pick-up tube uniformly.

The horizontal bias light shading correction signal is made by VR13 and VR14 on the Correction board. Also the vertical bias light shading correction signal is made by VR8 and VR9 on the Deflection board with the bias light correction section inside IC2 on the Process board to corrects the vertical bias light shading.

Details

The output signal of the Preamplifier board is mixed with the horizontal bias light shading correction signal supplied through R26 from pin 9 of CN12, it goes to the amplifier inside IC2 through pin 5. The amplified pre-video signal from the amplifier is mixed with the V bias light correction signal for correcting vertical bias light shading.

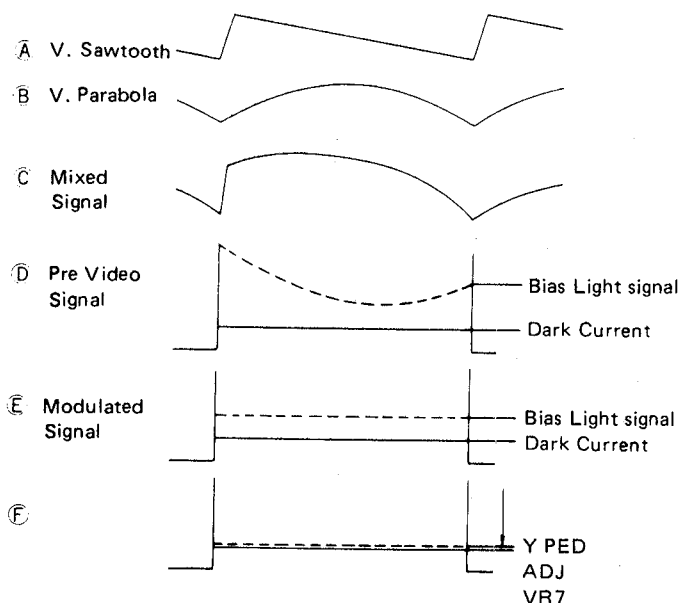


Fig. 4-2-1 Bias Light Correction

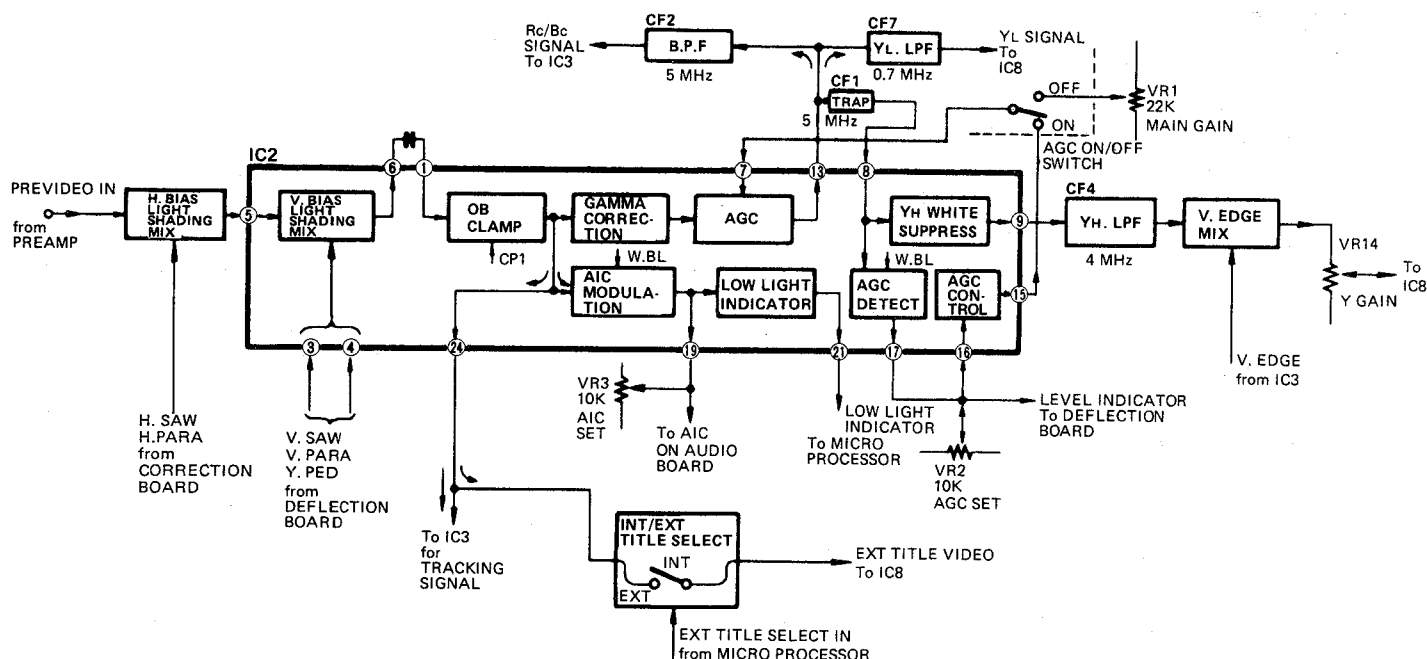


Fig. 4-2-2 Signal Processing Circuit

The vertical(V) sawtooth A and parabola B signals are fed to the wiper arms of VR9 (Bs V.SAW) and VR8 (Bs V.PARA) respectively in the Deflection board.

These waveforms are applied from the Deflection board to both the non-inverted (pin 3) and inverted (pin 4) inputs of bias light shading correction circuit in IC2, where a positive or negative mixed signal C of V.sawtooth and parabola signals are made depending on the position of these controls.

VR7 (Y PED) controls the positive input potential of bias light shading correction circuit to change the DC level of mixed signal C.

The multiplexed signal of the clamp pulse-1 (CP1), PRE BL pulse and W.BL pulse is fed from the pulse generator circuit on the Sync-1 board to the pulse separator inside IC2 through pin 22, where the CP1, PRE BL pulse and W.BL pulse are separated.

The separated PRE BL pulse is fed to the bias light shading correction circuit inside IC2. The amplified pre-video signal D is then modulated by the signal C and PRE BL pulse (E & F).

The corrected pre-video signal is then fed to the clamp circuit in IC2.

4-2-2 Optical Black Clamp Circuit

Outline

The pick-up tube sends an output current corresponding to the incoming light intensity, but even when no light reaches the target, an output current called dark current is obtained.

The dark current of the pick-up tube varies with the temperature of the pick-up tube. In a TV camera using a pick-up tube, the dark level of the output signal is unstable with respect to changing temperature.

In a color camera using the single carrier frequency multiplexing system, the red(R) and blue(B) signals modulated at 5MHz are riding on top of the green(G) signal. Thus the black level of the R and B signals are free from temperature variations because they are independent of pick-up tube dark current. However, the black level of the Y signal which is obtained by removing the modulated R and B components from the pick-up tube output increases or decreases according to temperature variations. Therefore, the black level balance between the Y_L and R signals, and between Y_L and B signals are lost due to a temperature variations and this causes a change in color reproduction. This circuit receives the pre-video signal from the bias light shading correction circuit and clamps its dark current level for correcting the black level variation.

Details

The pre-video signal which contains the modulated red/blue signals and green signal is fed from the optical black correction circuit to the optical black clamp circuit inside IC2. A metallic strip (optical black) for cutting the incoming light at the end of the horizontal scanning period is built into the pick-up tube faceplate. When the beam scans the optical black portion G, the dark current of the pick-up tube is produced and this signal portion H is clamped to a fixed DC potential, so that the black level variation due to a change of dark current is sensed.

In other words, the dark current level H of the pre-video signal H supplied to the clamp circuit inside IC2 is clamped by the clamp pulse-1 (CP1) I separated from the multiplexed signal of CP1, pre BL and wide BL pulses inside IC2. (The multiplexed signal of CP1, pre BL and wide BL pulses are generated in the pulse generator circuit, mixed and then fed to the pulse separator where they are separated.)

Therefore, even if the dark current level drifts due to the temperature variations, the DC potential of the optical black (OB) level is held constant.

In this way, the black level variation is corrected.

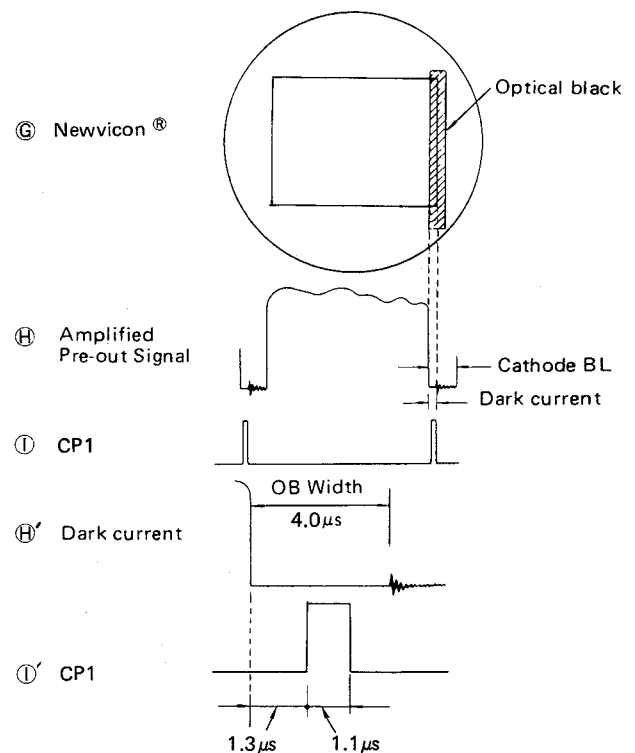


Fig. 4-2-3 OB Clamp

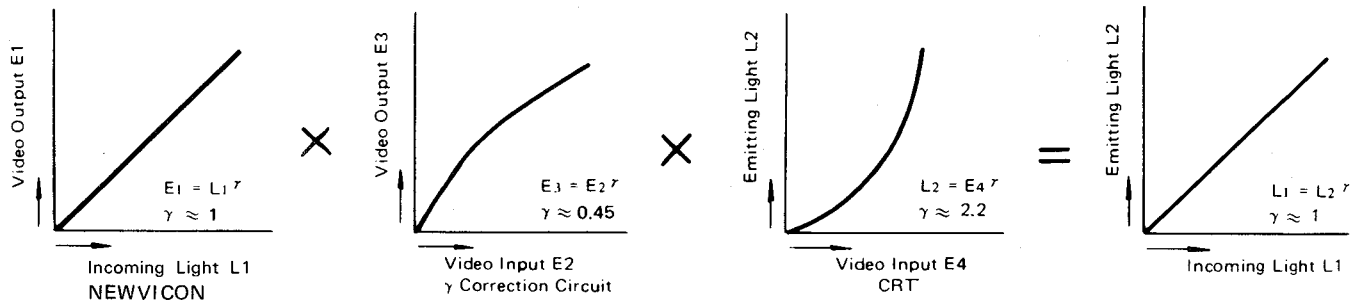


Fig. 4-2-4 Gamma Correction

4-2-3 Gamma Correction Circuit

Outline

This circuit corrects the non-linear photoelectric conversion characteristic of cathode ray tube (CRT) and reproduces a linear picture of high fidelity on the monitor.

In order for a televised picture to have the same contrast gradation as the original scene, the system (including the pick-up tube, signal processing inside camera and monitor, and CRT) gamma must be equal to 1.

The gamma characteristic of Newvicon® is approx. 1.0 and the gamma characteristic of the monitor CRT is approx. 2.2, so that the gamma characteristic of the gamma correction circuit should be approx. 0.45, which makes the total gamma to be approx. 1.0 as shown in Fig. 4-2-4.

Details

The pre-video signal is fed to the gamma(r) correction circuit and undergoes the gamma correction. Since the modulated red(R) and blue(B) signals are ridden on the green(G) signal, the negative feedback gamma correction circuit is adapted.

4-2-4 Automatic Iris Control Detection Circuit

Outline

This circuit detects the DC voltage corresponding to the light intensity and sends this DC voltage to the automatic iris control drive circuit in the Audio/Lens Control board.

Details

The wide BL (W.BL) pulse separated from CP1/PRE BL/W.BL mixed signal is supplied to the AIC modulation circuit inside IC2 from the pulse separator.

The pre-video signal is fed from the PRE BL mix circuit to the modulation circuit, where the pre-video signal is modulated by the W.BL pulse.

The modulated pre-video signal is peak-rectified in the modulation circuit and converted into DC voltage corresponding to the pre-video level i.e., the incoming light intensity. This DC voltage is fed through pin 19 of IC2 and terminal N0. 13 of CN3 to the automatic iris control circuit in the Audio/lens control board together with the DC voltage set by VR3 (AIC SET) which sets the normal iris stop at the standard light intensity. The DC voltage is also supplied to the low light indicator circuit in IC2.

When the camera is operated in the normally illuminated scene, the output from the low light indicator at pin 21 of IC2 is low level. However, when the camera is aimed at the weakly illuminated scene, the output becomes high level and it is sent to the Microprocessor board for displaying the graphics in the EVF.

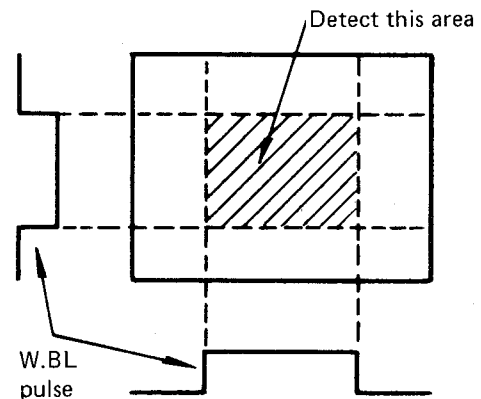


Fig. 4-2-5 Automatic Iris Control Detection and Automatic Gain Control Detection

4-2-5 Automatic Gain Control Circuit

Outline

This circuit amplifies the preamplifier output signal. The amplified signal level is maintained constant by automatically gain controlled amplifier. The gain of the amplifier starts to vary only when the lens iris is fully opened.

Details

The pre-video signal from the gamma correction circuit in IC2 is fed through the AGC amplifier and amplifier to trap CF1 which removes the 5MHz modulated component and the luminance (Y) signal is obtained. The Y signal is then applied to the AGC detect circuit where the Y signal is modulated by the wide BL pulse from the pulse separator and the modulated Y signal is made for detecting signal level corresponding to the center image. The modulated Y signal is peakrectified in the AGC detect circuit and converted into DC voltage corresponding to the Y signal level i.e., the incoming light intensity. This DC voltage is then fed through pins 17 and 16 of IC2 to the AGC control circuit where it is compared with the reference DC voltage. The error between the DC voltages is fed through the AGC ON/OFF switch SW4 to the AGC amplifier to control its gain.

When the camera is used in the normally illuminated scene, the signal level is maintained constant by automatically iris adjusted lens. Therefore the gain of AGC amplifier does not change. However, when the camera is aimed at the weakly illuminated scene and lens iris becomes wide open, the Y signal level is decreased. The decreased Y signal level is detected by the AGC detection circuit and converted into the DC voltage. This DC voltage is fed through the AGC control circuit and the AGC ON/OFF switch SW4 to the AGC amplifier to control the gain of amplifier.

In this way the signal level corresponding to normal and relatively high illumination is kept constant by the lens iris opening, while the signal level corresponding to relatively low illumination is controlled by the AGC circuit.

The gain controlled pre-video signal which has the modulated red and blue signal at pin 13 of IC2 is supplied to the luminance signal processing circuit and red and blue separation circuit.

VR2 (AGC SET) sets the gain of the amplifier at the standard light intensity in the automatic gain control mode.

VR1 (MANUAL GAIN) sets the gain of the amplifier at the standard light intensity in the manual gain control mode.

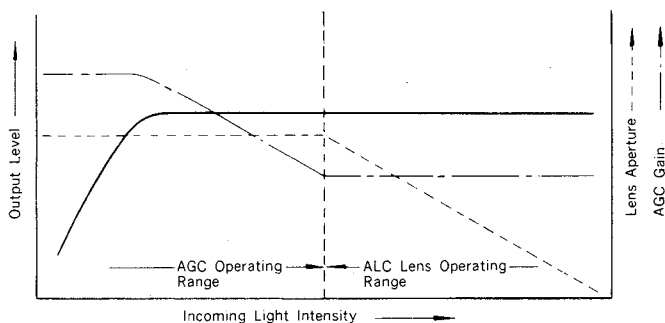


Fig. 4-2-6 AGC Operation

4-2-6 Y_H Signal Circuit

Outline

This circuit receives the amplified pre-video signal from the automatic gain control circuit and generates the luminance (Y_H) signal having high frequency response characteristic.

Details

The amplified pre-video signal is fed from the AGC circuit through pin 13 of IC2 to trap CF1 which removes the 5MHz modulated component and luminance (Y) signal is obtained. The Y signal at pin 8 of IC2 is fed to the Y_H white suppress circuit, where the high level of Y signal is slightly suppressed. The suppressed Y signal is then supplied to 4MHz low pass filter CF4, where the frequency response of Y signal is limited to 4MHz, and the Y_H signal having high frequency response characteristic is generated.

The Y_H signal is then mixed with the vertical edge signal supplied from the vertical edge signal generator circuit. After its level is set by VR14 (Y GAIN), the Y_H signal is supplied to the horizontal aperture signal circuit in IC8.

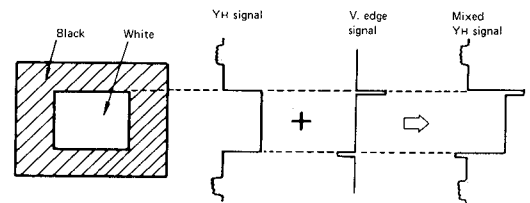


Fig. 4-2-7 Y_H Signal Processing

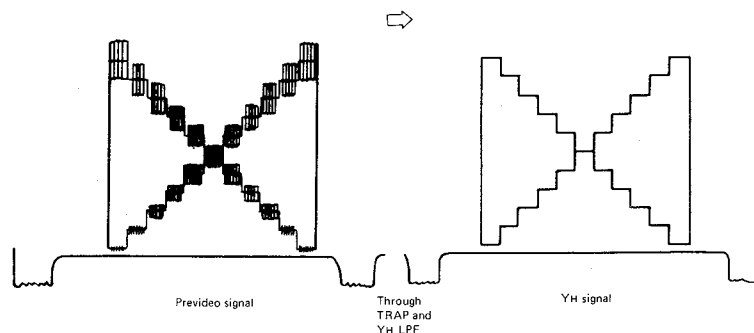


Fig. 4-2-8 Trap Effect

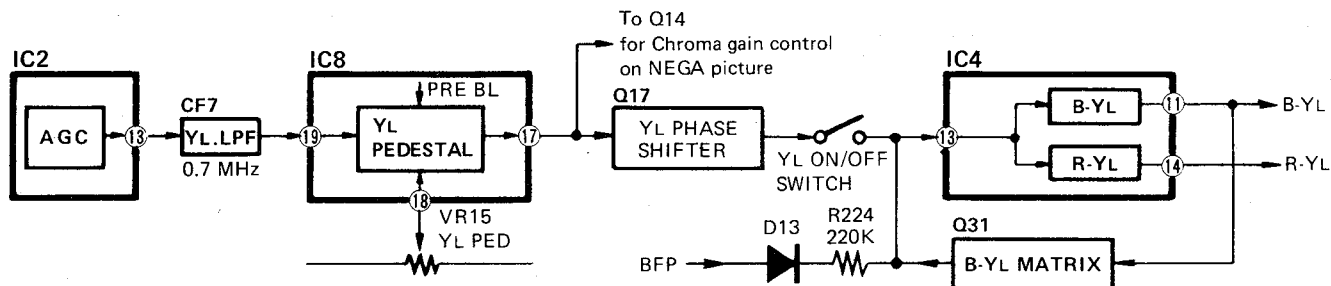


Fig. 4-2-9 Y_L Signal Circuit

4-2-7 Y_L Signal Circuit

This circuit receives the amplified pre-video signal from the automatic gain control circuit and generates the luminance (Y_L) signal having low frequency response characteristic.

Details

The amplified pre-video signal is fed from the AGC circuit through pin 13 of IC2 to 0.7MHz low pass filter CF7, where the 5MHz modulated component is removed and the luminance (Y_L) signal of which frequency response is limited to 0.7MHz is obtained. The Y_L signal thus made is fed to the Y_L pedestal circuit inside IC8, where Y_L signal is mixed with the pre BL pulse and the mixed signal is made. The mixed signal's low level pre BL portion is clipped and its pedestal level is set. The clip level (pedestal level) is set by VR15 (Y_L PED).

The Y_L signal whose pedestal level is set is supplied from pin 17 of IC8 to pin 13 of IC4, the R- Y_L /B- Y_L signal circuit in the red and blue separation & Chroma processing circuit through Y_L phase shifter Q17.

CT3 (Y_L PHASE) is a control for Y_L phase.

Q31 is a matrix circuit which amplifies and inverts the R- Y_L signal and mix it to Y_L signal for better color reproduction.

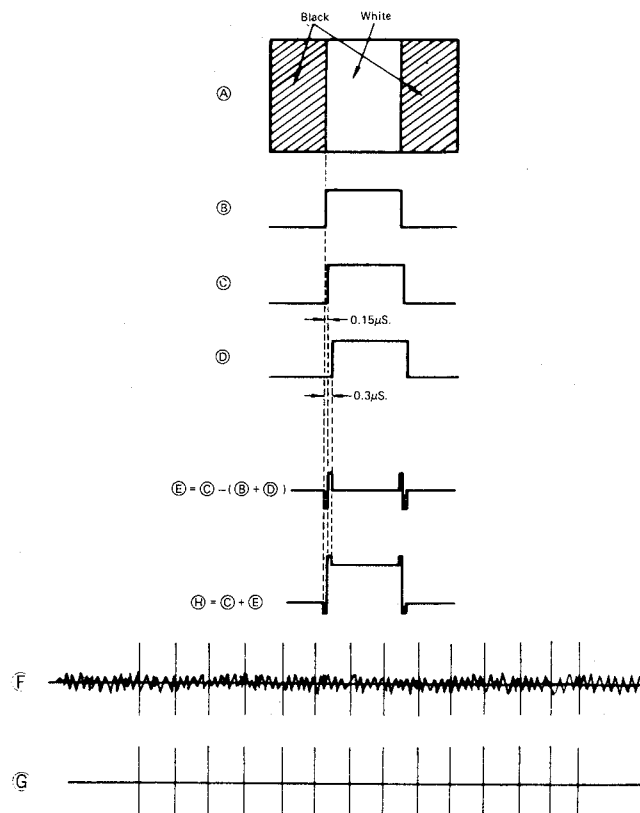


Fig. 4-3-1 Horizontal Aperture Signal

4-3 Horizontal Aperture Signal Generator Circuit

Outline

This circuit generates the horizontal(H) edge (aperture) signal to enhance the horizontal resolution.

Details

The luminance (Y_H) signal having high frequency response is fed from the Y_H signal circuit to the H.aperture generator circuit.

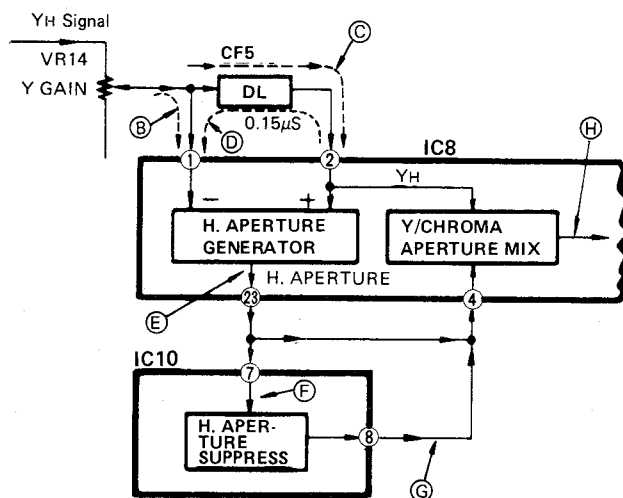


Fig. 4-3-2 Horizontal Aperture Signal Generator Circuit

When the camera is aimed at an object A for example, the signal B passed through pin 1 of IC8, signal C delayed $0.15\ \mu\text{s}$ by delay line CF5 and amplified in the H.aperture generator circuit and signal D which results from the delayed Y_H signal being reflected back through CF5 and delayed again ($0.3\ \mu\text{s}$) appear at the output of the H.aperture generator circuit where they are mixed in fixed proportions to make up the H.aperture signal E. The H.aperture signal obtained in this way is applied through pin 23 of IC8 and pin 7 of IC10 to the H.aperture noise suppress/coring circuit, where the noise mixed in the H.aperture signal F is removed (G).

The H.aperture signal which undergoes the noise coring is then supplied through pin 4 of IC8 to the Y/chroma/aperture mix circuit, where it is mixed with the luminance and chrominance signal.

4-4 Vertical Edge Signal Generator Circuit

Outline

This circuit generates a vertical edge signal for increasing the vertical resolution by enhancing vertical edge contrast.

Details

The luminance (Y(edge)) signal A, for making the vertical(V) edge signal, supplied from pin 10 of IC2 is fed to the Y(edge) delay circuit IC9 (CCD:charged coupled device) through pin 5. In the Y(edge) delay circuit, the Y(edge) signal is delayed 1H line by IC9. The 1H delayed signal obtained at pin 2 of IC9 B is fed to pin 2 of IC3 through buffer Q18 and low pass filter CF8 and VR18 (V.EDGE BALANCE). Also the undelayed Y(edge) signal is fed from pin 10 of IC2 to pin 4 of IC3. The 1H delayed Y(edge) signal B is mixed with the undelayed Y(edge) signal A to form a vertical edge signal C. The vertical edge signal is fed to the V.edge amplifier in IC3. The amplified V.edge signal is fed to the detection circuit in IC3, where the positive V.edge signal D is generated. This signal is sent to the chroma gain control circuit to reduce the vertical spurious signal. The V.edge signal D is fed to the mixing circuit in IC3, where it is mixed with the amplified V.edge and V.edge signal E is made. The V.edge signal E is sent to the vertical transient spurious correction circuit inside IC3 through pin 9, and to the Y_H signal circuit where it is mixed with the Y_H signal to make sharp picture.

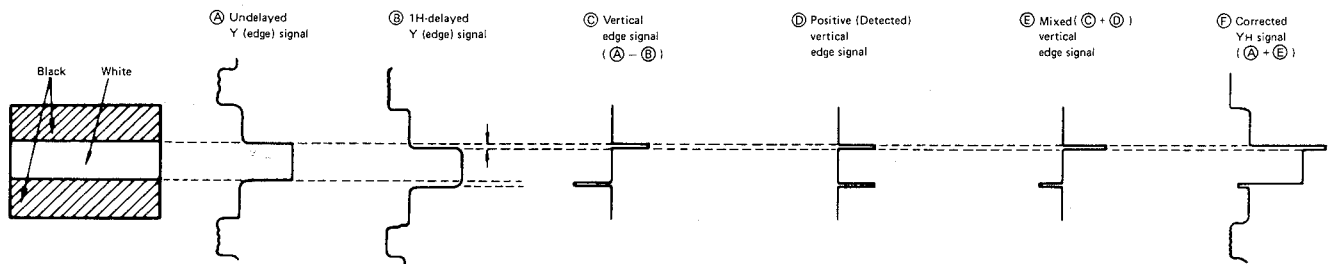


Fig. 4-4-1 Vertical Edge Signal

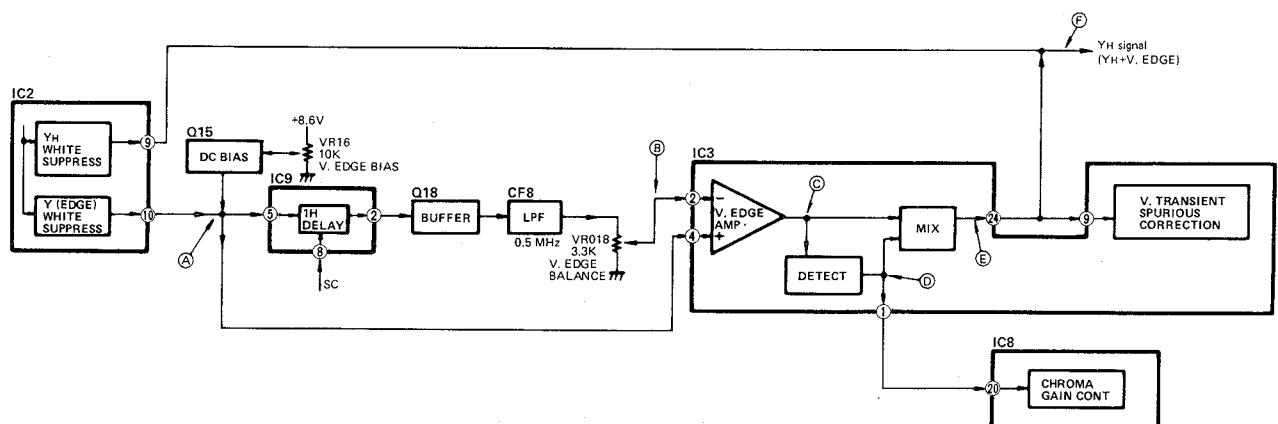


Fig. 4-4-2 Vertical Edge Signal Generator Circuit

4-5 Red and Blue Separation & Chroma Processing Circuit

This circuit consists of the red and blue separation circuit, the vertical transient spurious correction circuit, the shading correction, the tracking correction circuit, the R-Y_L signal circuit, the B-Y_L signal circuit and the chroma clip signal circuit.

4-5-1 Red and Blue Separation Circuit

Outline

This circuit takes out the modulated red(Rc) and blue (Bc) signals from the combined preamplifier output signal which is composed of a green(G) signal mixed with 5MHz modulated red(Rc) and blue(Bc) signal.

Details

The amplified pre-video signal A obtained at pin 13 of IC2 is fed to 5MHz band pass filter (BPF) CF2 where the Rc/Bc signal B is detected. The detected Rc/Bc signal is then supplied through VR4 (R/B GAIN) to the R/B gain control circuit.

When the lens iris becomes fully open, the modulation depth of red and blue signals decrease. It is compensated by controlling the gain of the R/B gain control circuit with the DC voltage corresponding to the lens iris opening. This DC voltage is fed from the lens to the R/B gain control circuit. The gain controlled Rc/Bc signal is then

supplied to the 90° phase shifter through pre BL mix circuit where the noise on the blanking period is removed. The 90° phaseshifted Rc/Bc signal C obtained at pin 11 of IC3 is applied to the R/B separation circuit inside IC4 through pin 2. CT2 (R/B SEPARATION-1) is a control for shifting the phase of Rc/Bc signal by 90°. The Rc/Bc signal B at pin 6 of IC3 is supplied to 1H delay line DL1 where it is delayed one horizontal line (64 μ sec). 1H delayed Rc/Bc signal is then sent to the vertical transient spurious correction circuit inside IC3 through VR5 (R/B SEPARATION-2) and pin 18. (The vertical transient spurious correction circuit will be described later.)

The Rc/Bc signal D undergoes the vertical transient spurious correction and inverted in the correction circuit is applied to the R/B separation circuit inside IC4 through pin 24.

In the R/B separation circuit, the 90° phase-shifted Rc/Bc signal C and the inverted 1H-delayed Rc/Bc signal D are added forming the Rc signal E, and the Rc/Bc signal C and the Rc/Bc signal D are subtracted each other forming the Bc signal F.

The Rc and Bc signals thus separated are fed to the respective shading/tracking correction circuits.

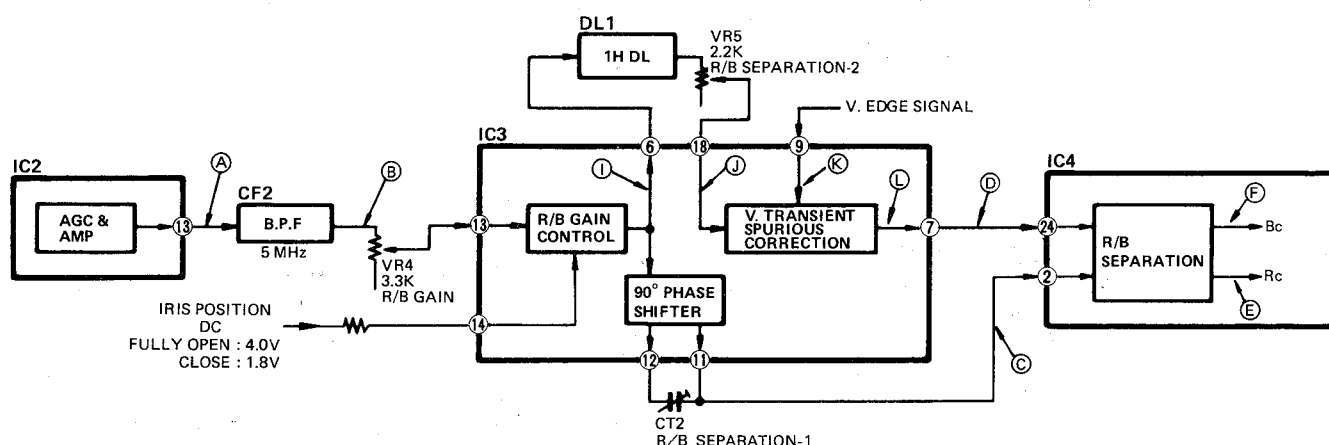


Fig. 4-5-1 Red and Blue Separation Circuit

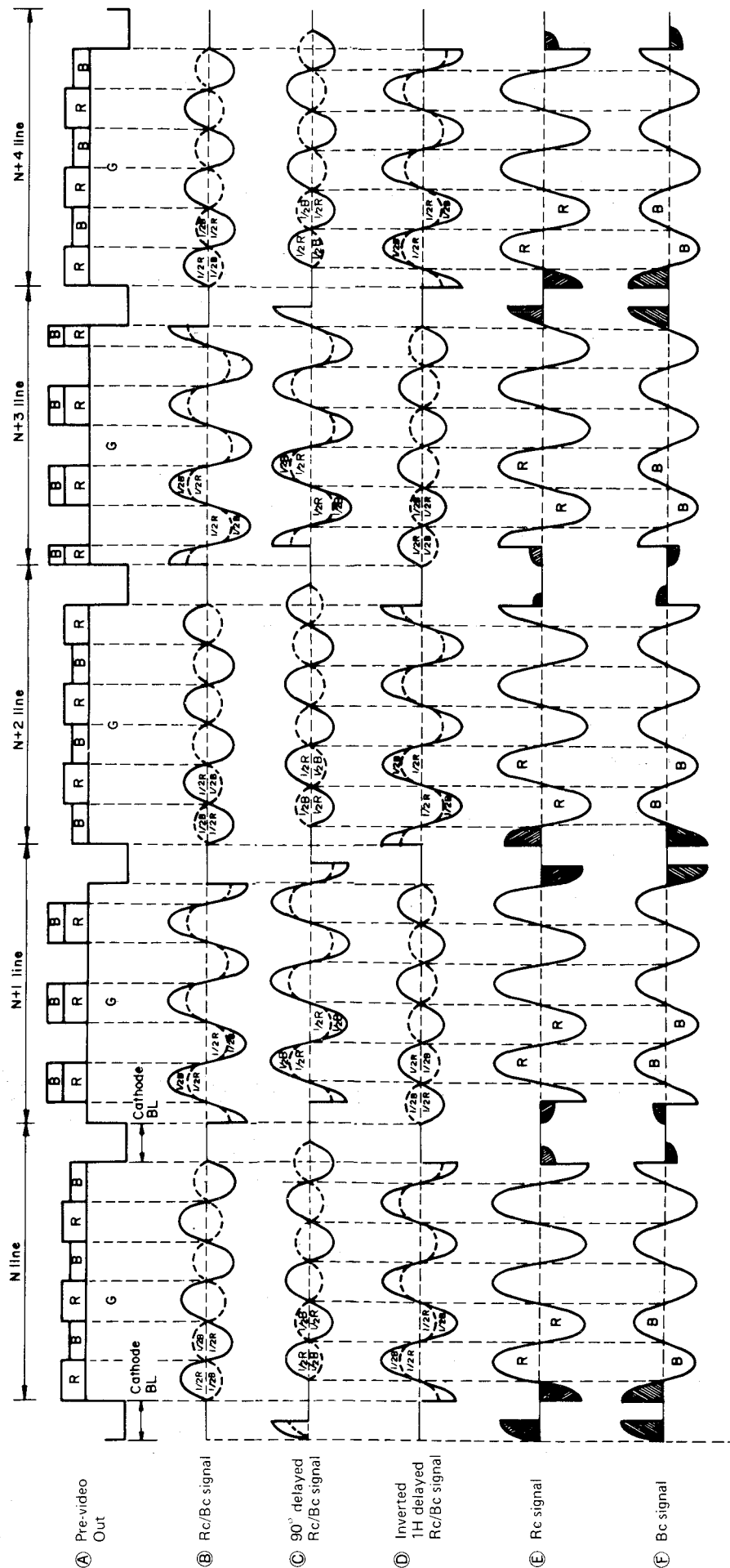


Fig. 4-5-2 Red and Blue Signal Separation

4-5-2 Vertical Transient Spurious Correction Circuit

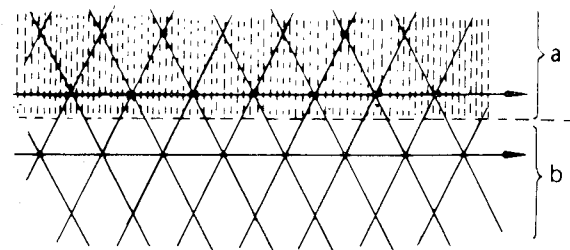
Outline

As described previously in red and blue separation circuit, the Rc and Bc signals are separated from each other by addition or subtraction of the Rc/Bc signal delayed one line(1H) and the 90° phase-shifted Rc/Bc signals but not delayed.

When a pattern such as shown below is seen by the camera, the Rc/Bc signal which is not delayed appears as in I, and the Rc/Bc signal delayed one line(1H) becomes as in J.

Therefore, it is impossible to secure vertical correlation between Rc/Bc signals of N+1 line, and a spurious signal differing in level of Rc and Bc signals against Y signal H is generated, and the vertical(V) edge of the object is unnaturally colored by this spurious signal.

The vertical transient spurious correction circuit controls the amplitude of 1H-delayed Rc/Bc signal J corresponding to the N+1 line with vertical(V) edge signal K and the signal L is made. This provides vertical correlation between Rc/Bc signals I and L prior to color separation.



a : Dark object
b : Bright object

Fig. 4-5-3

Details

The vertical edge signal K is sent from the vertical edge signal generator circuit to the vertical transient spurious correction circuit inside IC3 through pin 9 of IC3. In this circuit, those parts of the 1H-delayed Rc/Bc signal J which do not correlate with the Rc/Bc signal I (not 1H-delayed) are controlled in level by the vertical edge signal K. The corrected Rc/Bc signal L is fed to the R/B separation circuit inside IC4 through pin 2 of IC4 and pin 24 of IC4.

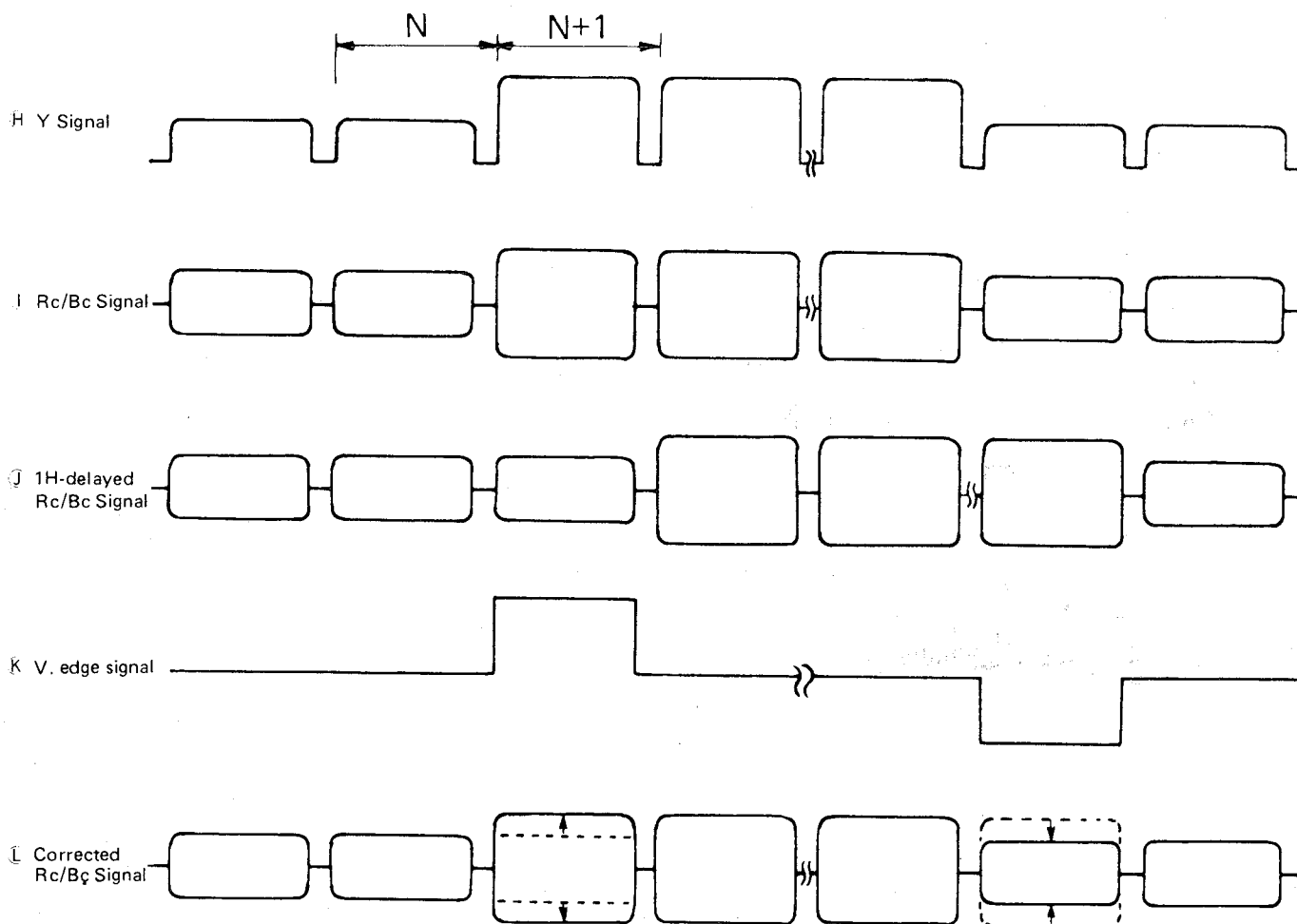


Fig. 4-5-4 Vertical Transient Spurious Correction

4-5-3 Shading Correction Circuit

Outline

Even when dynamic focus is applied to grid-4(G4) of pick-up tube, the non-uniformity of modulation due to uneven focus on the target can not be completely eliminated.

Modulation non-uniformity also occurs due to non-uniform structure in the photoconductive layer of the pick-up tube (manufacture tolerance).

The shading correction circuit compensates for residual picture shading using horizontal(H) and vertical(V) sawtooth and parabola signals in the correction board.

Details

o Red shading correction

The mixed horizontal and vertical red shading correction signal generated in the Correction board is fed to the red shading/tracking correction circuit inside IC4 through pin 22.

Suppose a uniformly illuminated white object is seen by the camera and the Rc signal has a shading (unevenness of amplitude) M. This is sent to the shading/tracking correction circuit from the Rc/Bc separation circuit inside IC4. In this case, the shading correction signal N is generated in the Correction board and it is applied to the correction circuit.

In this case, the four red shading controls are adjusted to generate the shading correction signal N. The Rc signal M is modulated by the shading correction signal N and the corrected signal O is produced. The shading of the Rc signal O is removed in the correction circuit and the Rc signal P is obtained. In this way, the shading of the Rc signal is corrected.

The corrected Rc signal is then fed to the R-YL signal circuit inside IC4.

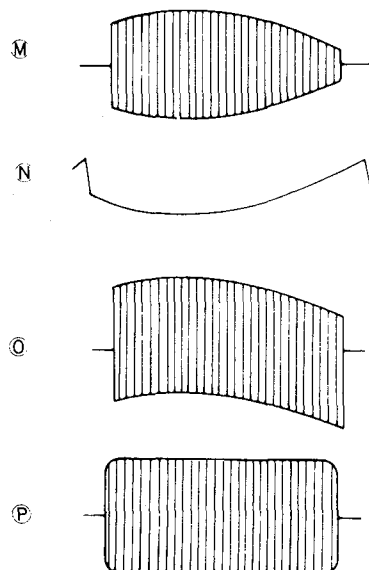


Fig. 4-5-5 Shading Correction

o Blue shading correction

As in the case of red shading correction, the mixed horizontal and vertical blue shading correction signal generated in the Correction board is fed to the shading/tracking correction circuit inside IC4 through pin 3, where it modulates the modulated blue(Bc) signal (supplied from the R/B separation circuit) for the shading correction. The shading-corrected Bc signal is then applied to the B-YL signal circuit inside IC4.

4-5-4 Tracking Correction Circuit

Outline

In this color camera, the red(R) and blue(B) signals modulated at 5MHz (high frequency component) are riding on top of the green(G) signal (low frequency component) when they are extracted from the pick-up tube.

The photoelectric conversion characteristic of the pick-up tube is different between the high frequency component and low frequency component.

The modulation depth of Rc and Bc signals corresponding to the weakly illuminated scene is reduced due to the over-beam in the pick-up tube.

As a result, the R and B signals obtained by detecting the Rc and Bc signals do not track with the Y_L signal. This circuit generates the tracking signals for correcting the characteristic of the R and B signals, and tracks them with the Y_L signal.

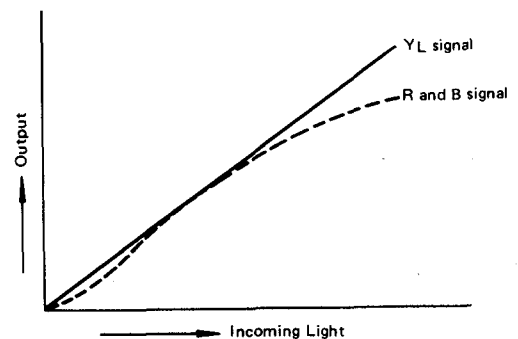


Fig. 4-5-6 Mistracking of YL and R/B Signal

Details

The amplified pre-video signal Q (which contains the modulated red and blue signals as well as the green signal) obtained at pin 24 of IC2 is fed to the low pass filter consisting of L1 and C13, where the 5MHz modulated component is removed and a luminance (Y) signal R is made.

The Y signal R is fed through pin 19 to the tracking signal generator inside IC3 where a tracking-1 signal S, a tracking-2 signal T and a tracking-3 signal U are generated respectively.

The tracking-1 signal S at pin 16 of IC3 is supplied to VR7 (B. TRACKING-1) and VR10 (R. TRACKING-1) for correcting the relatively low level of R and B signals. The tracking-2 signal T at pin 17 of IC3 is fed to VR6 (B. TRACKING-2) and VR11 (R. TRACKING-2) for correcting the relatively higher portion of R and B signals.

The tracking-3 signal U at pin 15 of IC3 is sent to VR8 (B. TRACKING-3) and VR9 (R. TRACKING-3) for correcting the high level of R and B signals. These tracking correction signals are supplied through the tracking controls to the R. shading/tracking correction circuit and B. shading/tracking correction circuit inside IC4, where they modulate the Rc and Bc signals. V come from the R/B separation circuit for correcting the linearity of Rc and Bc signal W. In this way, the R and B signals match the Y_L signal.

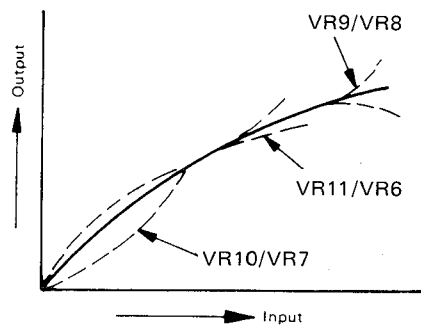


Fig. 4-5-8 Tracking Correction-2

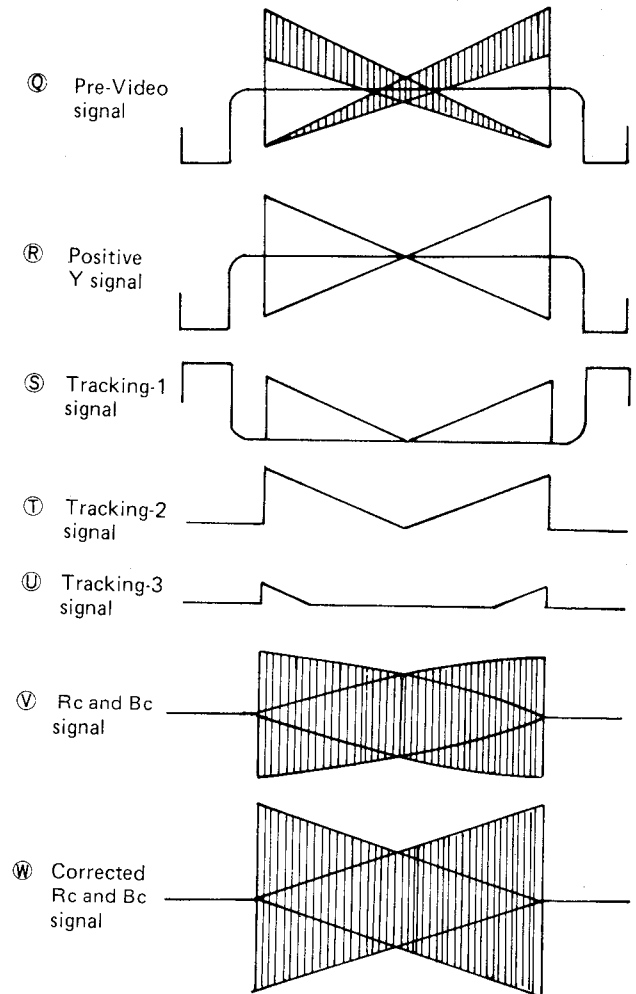


Fig. 4-5-7 Tracking Correction-1

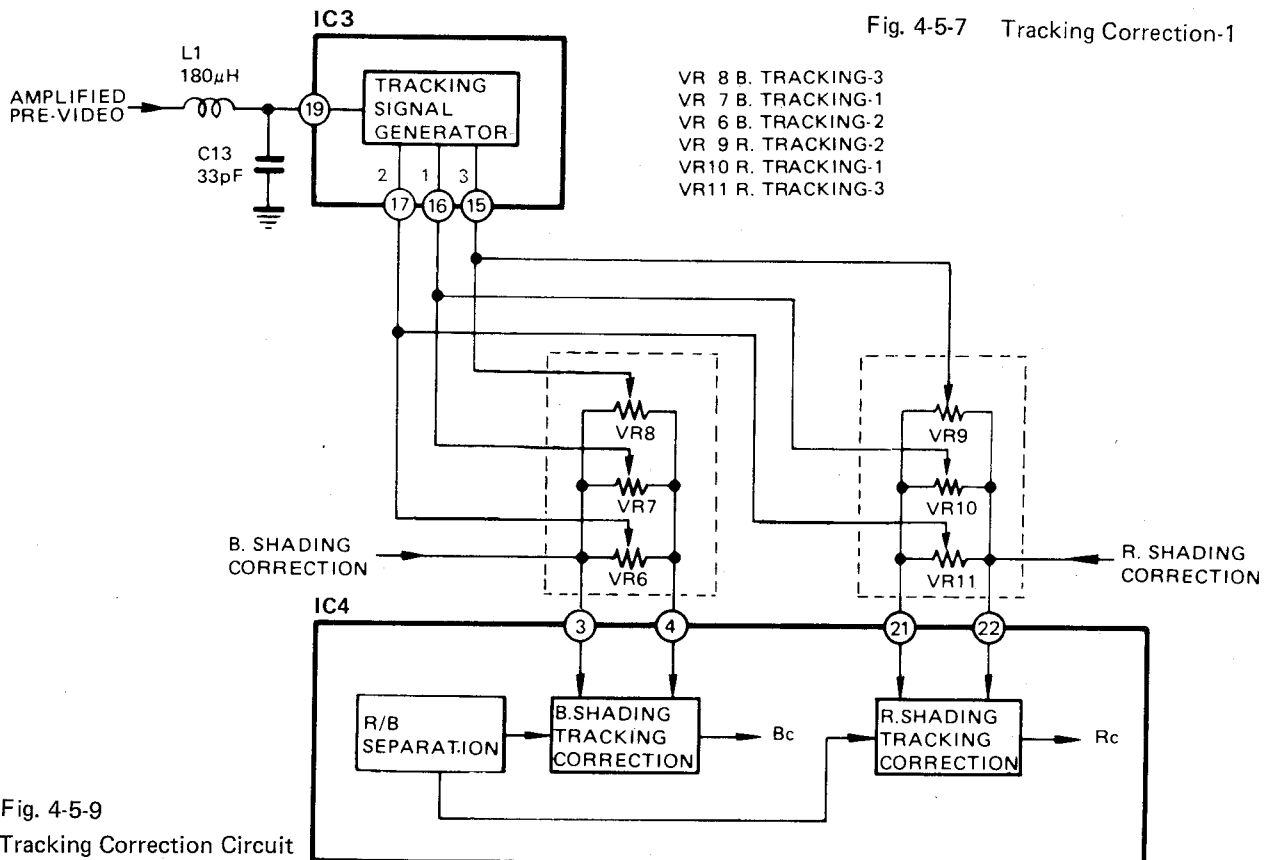


Fig. 4-5-9
Tracking Correction Circuit

4-5-5 R-Y_L Signal Circuit

Outline

This circuit receives the modulated red(R_c) signal from the red shading/tracking correction circuit and detects the red signal. The detected red signal and the Y_L signal supplied from the Y_L signal circuit make the R-Y_L color difference signal. The R-Y_L signal is fed to the chroma encoding circuit.

Details

The R_c signal A from the red shading/tracking correction circuit is fed to the gain control circuit whose gain is controlled for the automatic white balancing. The gain controlled R_c signal is sent to the amplifier through the PRE BL mixing circuit where the noise during the blanking period of R_c signal is removed. The positive R_c signal B and negative R_c signal C are obtained at the output of amplifier and they are forwarded to the detector. The R signal is sent to the low pass filter. The detector which extracts the red signal produces a unwanted 10MHz ripple signal D. The 10MHz component is removed by the low pass filter leaving only the red signal E.

The frequency response of red signal and Y_L signal also become same by the low pass filter.

The detected R_c signal D is then fed to the R-Y_L amplifier. The Y_L signal from the Y_L signal circuit is also supplied to the R-Y_L amplifier where the R-Y_L color difference signal is made up.

The resultant R-Y_L signal is fed through pin 14 of IC4 to the chroma encoding circuit.

The R-Y_L signal at pin 14 of IC4 is fed through R-Y_L matrix Q13 to the Y_H signal circuit and mixed with Y_H signal to compensate for better color reproduction. VR2 (BALANCE) which is located on the side of camera is a control for fine adjustment of the color balance. VR12 (R. GAIN) is a presetting control for the red signal level. VR13 (R. PED) is a control for setting the red pedestal. SW1 is the Y_L ON/OFF switch for disconnecting the Y_L signal.

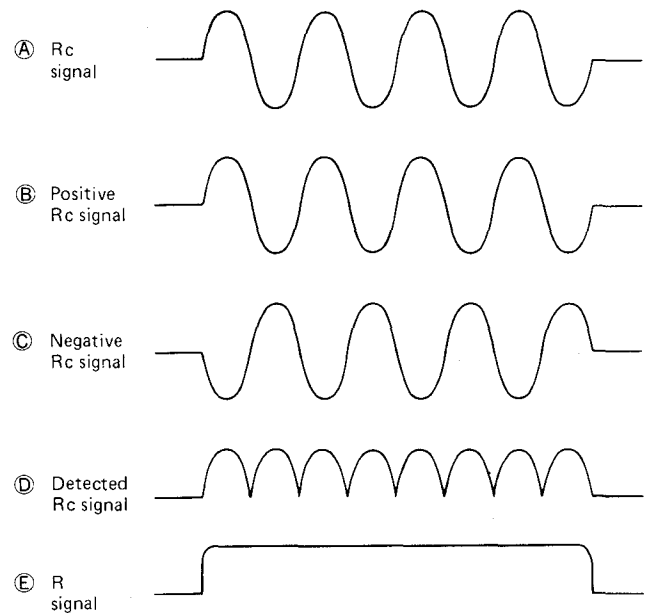


Fig. 4-5-10 Red Signal Detection

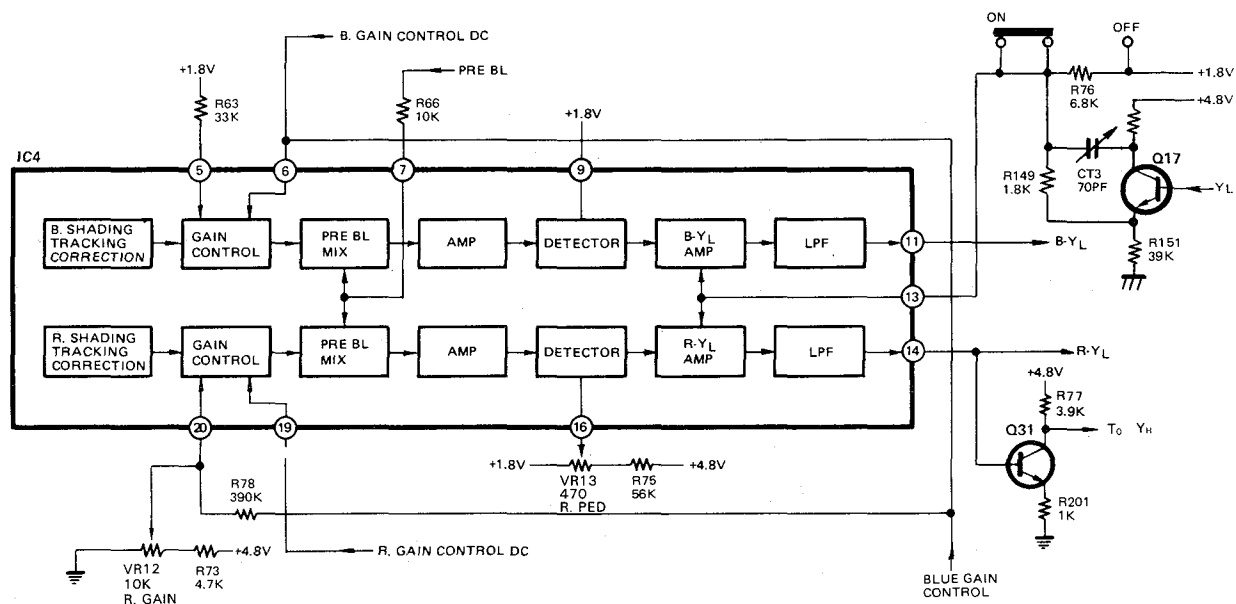


Fig. 4-5-11 R-Y_L/B-Y_L Signal Circuit

4-5-6 B-Y_L Signal Circuit

Outline

This circuit uses the same design as the R-Y_L signal circuit. The circuit receives the modulated blue(Bc) signal from the blue shading/tracking correction circuit and converts it to the blue signal. The B-Y_L signal is made by the detected red signal and Y_L signal supplied from the Y_L signal circuit, and fed to the chroma encoding circuit.

Details

The Bc signal from the blue shading/tracking correction circuit in IC4 is sent to B-Y_L amplifier after it undergoes the gain control, the preblanking mixing, the amplification and detection. The B-Y_L signal made by the detected B signal through the low pass filter which removes the 10MHz ripple signal and the Y_L signal is fed to the chroma encoding circuit.

4-5-7 Chroma Clip Signal Circuit

Outline

When the over-input signal level is fed to the amplifier or the beam of pick-up tube is insufficient to discharge the target due to excessive light reflected from a brightly illuminated object, the modulated red/blue signal components riding on to top of the green signal become saturated (G and H).

Therefore, the bright picture parts turn into an unnatural green color due to lack of red and blue.

This circuit receives the luminance(Y) signal and makes the chroma clip signal for clipping the unnatural green color. The chroma clip signal is sent to the chroma encoding circuit.

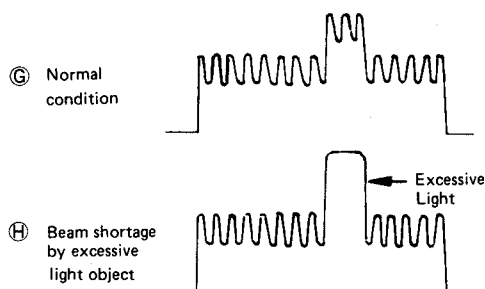


Fig. 4-5-12 Beam Shortage

Details

The pre-video signal at pin 24 of IC2 is fed to low pass filter which consists of L1 and C13 and the luminance (Y) signal I is made. The Y signal I is fed through pin 19 of IC3 to the white clip circuit where the high Y signal level J is detected. The detected high Y signal J, signal K delayed 0.5 μ s by delay line CF3 and signal L which results from the delayed signal K being reflected back through CF3 and delayed again (1 μ s) appear at the input of NAM (non-additive mixing) circuit.

The mixing signal M (J + L) is non-additively mixed with the signal K and a chroma clip signal N is made. The chroma clip signal N is fed from the NAM circuit to the chroma encoding circuit through the pulse separator/buffer and pin 23 of IC3, and to the VIDEO signal processing circuit through R51 together with the positive vertical edge signal comes through R47 (Refer to Vertical Edge Signal Generator Circuit.) to minimize unnatural green color around the bright object.

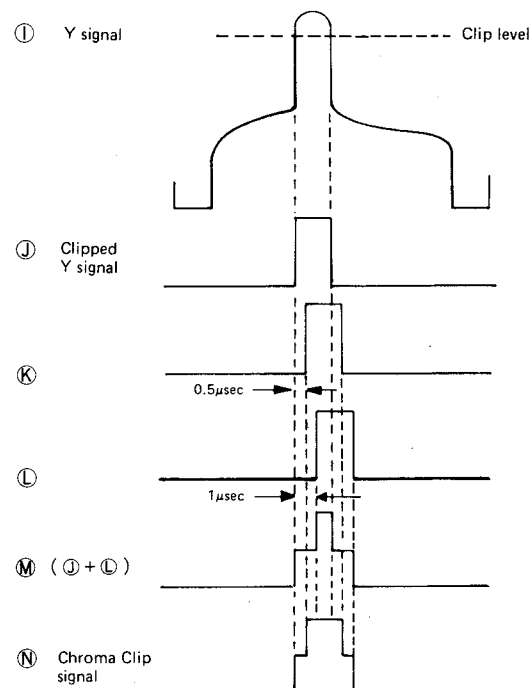


Fig. 4-5-13 Chroma Clip Signal

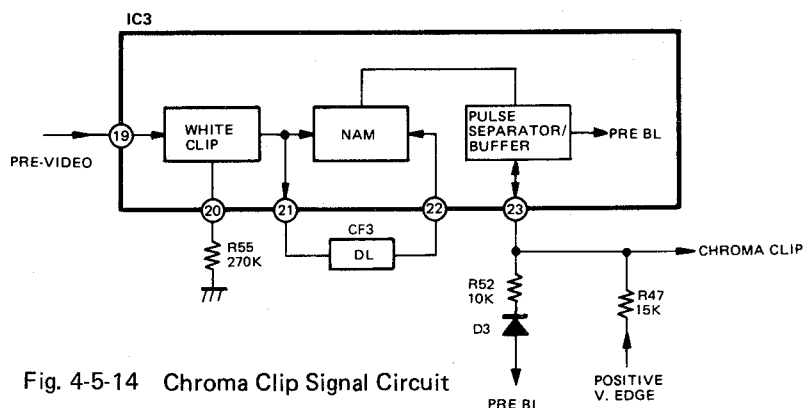


Fig. 4-5-14 Chroma Clip Signal Circuit

4-6 Chrominance Encoding Circuit

This circuit contains the +2.5V power circuit, the chrominance signal generator circuit, the chroma clip/suppression circuit and the white set detection circuit.

4-6-1 +2.5V Power Circuit

Outline

This circuit generates the regulated +2.5V DC which is used as power supply for IC10.

Details

+1.8V DC generated inside IC3 is fed through pin 5 and L10 to the emitter of Q21 which is used as a diode. The +2.5V DC obtained at the collector of Q21 is supplied to pin 6 of IC10 as a power supply.

4-6-2 Chrominance Signal Generator Circuit

Outline

This circuit receives the R-Y_L and B-Y_L color difference signals and modulates these base band color difference signal on two subcarrier differing in phase by 90° to generate a chrominance signal. The burst signal is also generated in this circuit.

Details

The R-Y_L color difference signal is fed from the R-Y_L signal circuit in IC4 to the R-Y_L clamp circuit in IC10 through pin 3, where the blanking period of R-Y_L signal is clamped by the clamp pulse-2 (CP2) from the pulse separator in IC10. The clamped R-Y_L signal is then supplied to the R-Y_L balance modulator where it is mixed with the burst flag pulse (BFP) applied from the pulse generator circuit through pin 2 of IC10 and clamp circuit. The R-Y_L signal with the burst flag pulse (BFP) modulates the (R-Y) subcarrier applied to the modulator from the pulse generator circuit through pin 14 of IC10. The modulator produces an amplitude modulated (suppressed carrier) signal.

Similarly, the B-Y_L color difference signal is fed from the B-Y_L signal circuit to the B-Y_L balance modulator circuit in IC10 through pin 4 of IC10 and the B-Y_L clamp circuit, where the B-Y_L signal is mixed with the burst flag pulse (BFP) supplied through pin 2 of IC10 and BFP clamp circuit. The B-Y_L signal with the burst flag pulse (BFP) and the (B-Y) subcarrier applied to the modulator through pin 16 of IC10 undergo suppressed carrier amplitude modulation. The R-Y_L modulated signal and the B-Y_L modulated signal is added forming the chrominance signal with the burst. The chrominance signal is then forwarded to the chroma clip/suppress circuit.

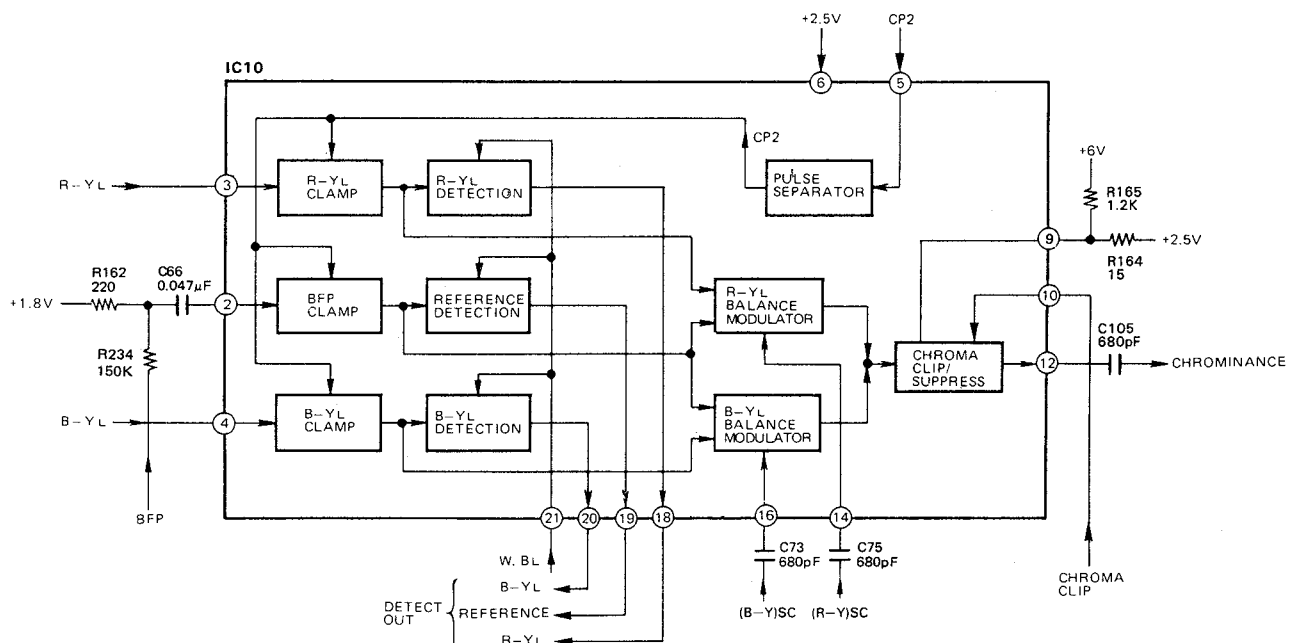


Fig. 4-6-1 Chroma Encoding Circuit

4-6-3 Chroma Clip/Suppress Circuit

Outline

This circuit contains the high Y level chroma clip circuit and low level chroma suppress circuit.

The high Y level chroma clip circuit clips the green color which results when an excessively bright object is shot with the camera. (Refer to Chroma Clip Signal Circuit for details.)

The low level chroma suppression circuit enhances color reproduction in low luminance condition by improving the white balance, when the color of the object is faint.

Details

The chrominance signal with the burst A is supplied to the chroma clip/suppress circuit from the R-Y_L and B-Y_L balance modulator circuits. The chroma clip signal B which is made in the chroma clip signal circuit in IC3 is supplied through pin 10 of IC10 to the chroma clip/suppress circuit where the chrominance signal corresponding to the excessive bright object is clipped C and does not reach the video output.

The chroma clip signal also suppresses the chrominance signal around the unnatural green color.

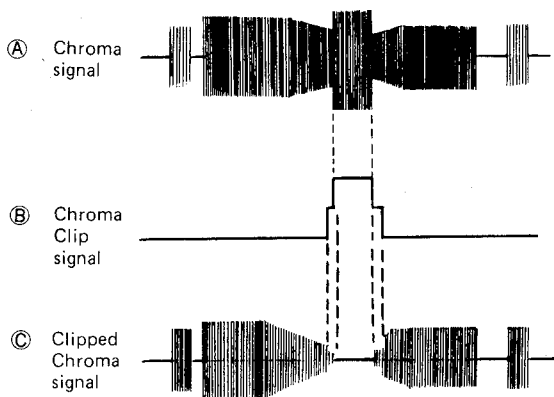


Fig. 4-6-2 Chroma Clip

The DC voltage obtained by dividing the voltage between +6V and +2.5V with R164 and R165, and fed to the chroma clip/suppress circuit through pin 9 of IC10 determines the low suppression level of chroma signal. This DC voltage is applied to the chroma clip/suppress circuit and clips the low chrominance level.

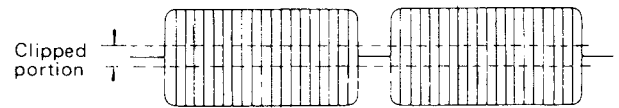


Fig. 4-6-3 Chroma Suppress

4-6-4 White Set Detection Circuit

Outline

This circuit receives the R-Y_L, B-Y_L and reference DC voltage from the respective clamp circuits and converts them to the DC voltages. The detected DC voltages are sent to the white balance setting circuit.

Details

The clamped R-Y_L, the clamped B-Y_L and the clamped burst flag pulse (BFP) are respectively fed to the detection circuits and their center portions are gated by the wide blanking (W.BL) pulse supplied through pin 21 of IC10 in order to set the white balance with the signal corresponding to the center image. The clamped burst flag pulse is gated by the W.BL pulse, the burst flag pulse is removed and only the clamp DC voltage is detected as a reference DC voltage. The gated signals are converted into the DC voltage in the detection circuit and fed through pins 18, 19 and 20 of IC10 to the white balance setting circuit.

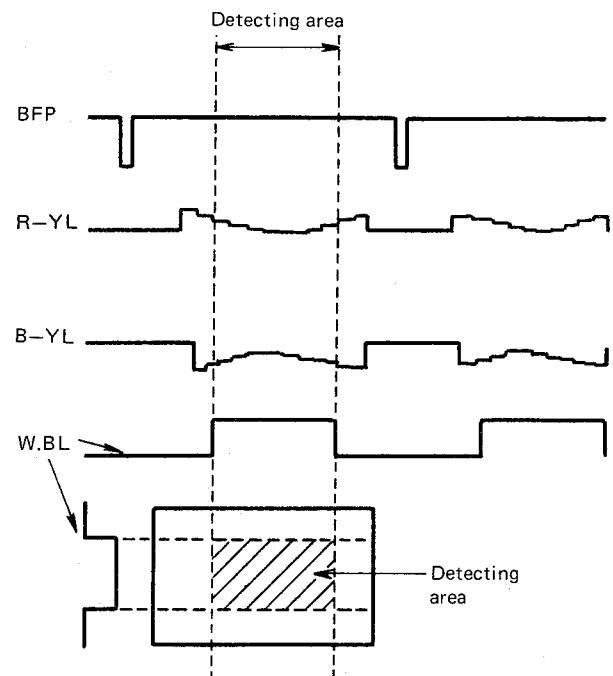


Fig. 4-6-4 White Set Detection

In the chroma clip/suppress circuit previously explained, the green color which results when the excessively bright object is shot with the camera is clipped by the chroma clip signal. (Refer for the detail to Chroma Clip/Suppress Circuit.) The chroma clip signal supplied to the chroma gain control circuit minimizes the remaining chrominance signal corresponding to the excessively bright object.

The vertical transient spurious correction circuit previously described minimizes the unnatural color appears at the vertical edge of object. (Refer for the detail to Vertical Transient Spurious Correction Circuit.) The positive vertical edge signal supplied to the chroma gain control circuit decreases the chrominance signal corresponding to the unnatural color at the vertical edge. The chrominance signal undergoes the chroma gain control is fed to the Y/chroma/aperture mixing circuit inside IC8. The mixed signal of the luminance (Y_H) signal and the vertical(V) edge signal is fed to the Y/CHROMA/APERTURE mixing circuit.

The horizontal aperture signal from the horizontal(H) aperture generator circuit and the H.aperture suppress circuit to the mixing circuit through pin 4 of IC8. In the mixing circuit, these signals are mixed.

The mixed signal is supplied to the fade circuit where its signal level is controlled by the fade control signal supplied from the fade/recording control circuit through pin 24 of IC8. (Refer for the details to fade/recording control circuit.)

Next, the mixed signal is supplied to the NEGA/POSI select circuit.

When the camera is used in the positive picture condition, the high level of nega/posi control signal is fed from the Microprocessor board through terminal No. 3 of B12 and pin 21 of IC8 to the negative/positive select circuit for selecting the positive position and the normal picture is observed.

If the nega/posi select switch on the side of camera is pressed, the nega/posi control signal is converted from the high level to the low level and the negative position is selected. Therefore when the camera is used for shooting the negative film, the normal picture can be observed by pressing the nega/posi select switch on the side.

However, since the color reproduction characteristic of negative film is different, the chrominance signal amplitude corresponding to the high Y level is extremely high. Q14 suppresses the chrominance signal when the camera is used in the negative position. In the negative position, the low level of nega/posi control signal is fed to the base of Q14 turning OFF Q14. When the Q14 is turned OFF, the Y_L signal obtained at pin 17 of IC14 is fed through R128, R125 and pin 20 of IC8 to the chroma gain control circuit where the Y_L signal suppresses the chrominance signal corresponding to the high Y level. In the positive position, the high level is sent to the base of Q14 and Q14 is turned ON. Therefore, the Y_L signal is not fed to the chroma gain control circuit.

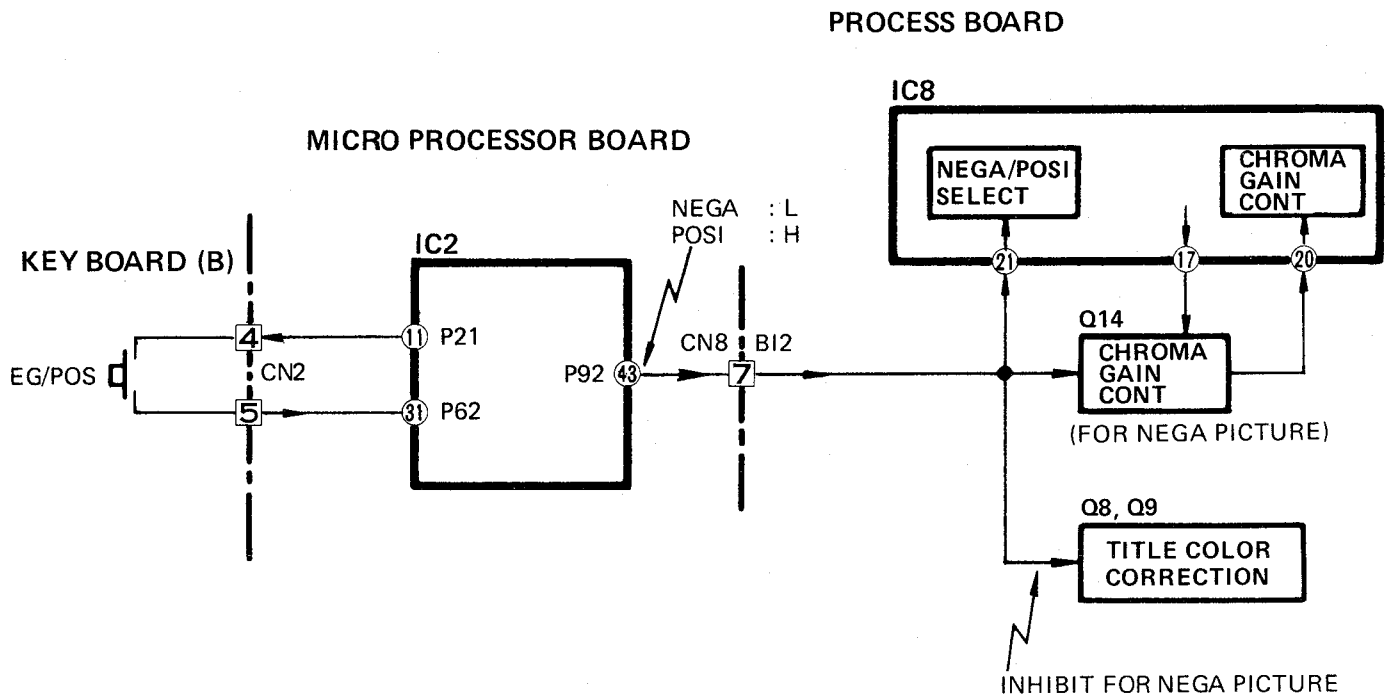


Fig. 4-8-2 NEGA/POSI Select Circuit

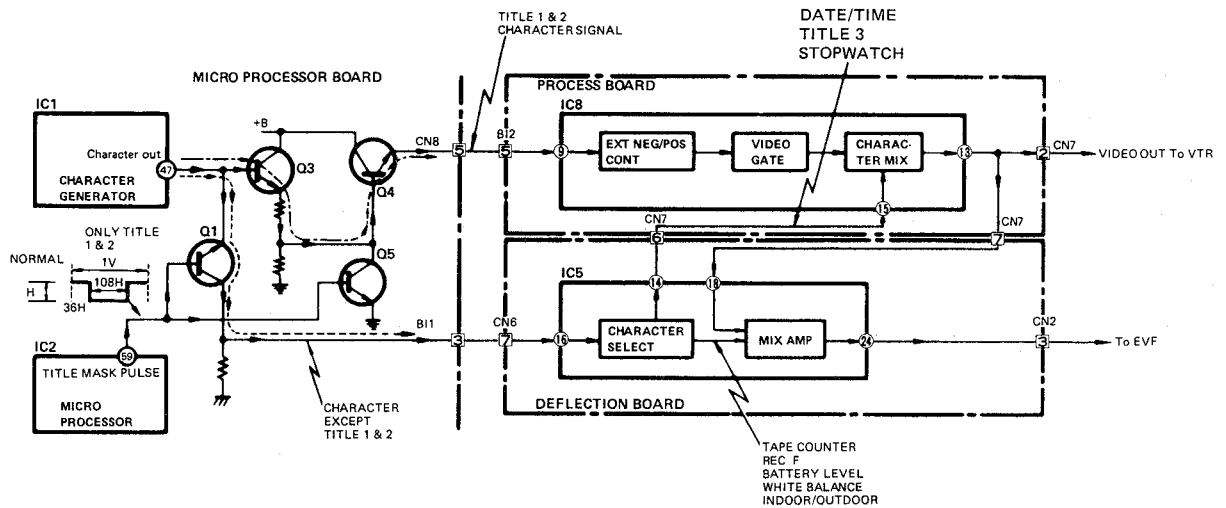


Fig. 4-8-3 Title 1 & 2 Character Signal Circuit-1

The mixed signal is then applied to the title mixing circuit.

The title 1 & 2 character signals generated in Micro-processor board is mixed with Y/Chroma signal. The title color/chroma signal is also mixed.

The title 1 & 2 character signal generated in IC1 on Microprocessor board and supplied to the character select circuit consisting of Q3, Q4 and Q5 through pin 41 of IC1. The title 1 & 2 character signals are then fed to pin 9 of IC8 on process board to mix with the video signal.

However, title 1 & 2 character signals can only be passed through the character select circuit. The character signals except title 1 & 2 are supplied to character select circuit in IC5 on Deflection board.

At the EXT VIDEO NEG/POS CONT section, the character signal polarity is selected by the external title polarity signal supplied from pin 8 of IC1 on Micro-processor board to pin 5 of IC8 on Process board. When the external title polarity signal is high, the output video signal becomes colored title with picture. When the external title polarity signal is changed to low, the keyed picture with bgcolor is generated.

The polarity selected character signal is then sent to the video gate circuit in IC8 on Process board.

At the video gate circuit, the Y/Chroma signal is gated/eliminated by the character signal and the title color/chroma signal is then inserted to the part of Y/Chroma signal which is eliminated by character signal.

However, the title color/chroma signal is generated at IC1 on process board and its color is controlled by the title color select DC signal generated at pins 2, 3 and 6 of IC1 on Microprocessor board. The (R-Y)SC and (B-Y)SC are also supplied from pins 5 and 6 of sync generator IC11 to pins 6 and 7 of IC1 respectively.

The generated title color/chroma signal obtained at pin 9 of IC1 is applied to title color phase shifter consisting of Q2, Q3 and Q30 on Process board and its phase is adjusted by CT1 (TITLE COLOR PHASE) to become specified phase. After that, the title color/chroma signal is fed to pin 10 of IC8, video gate circuit to insert it to Y/Chroma mixed signal.

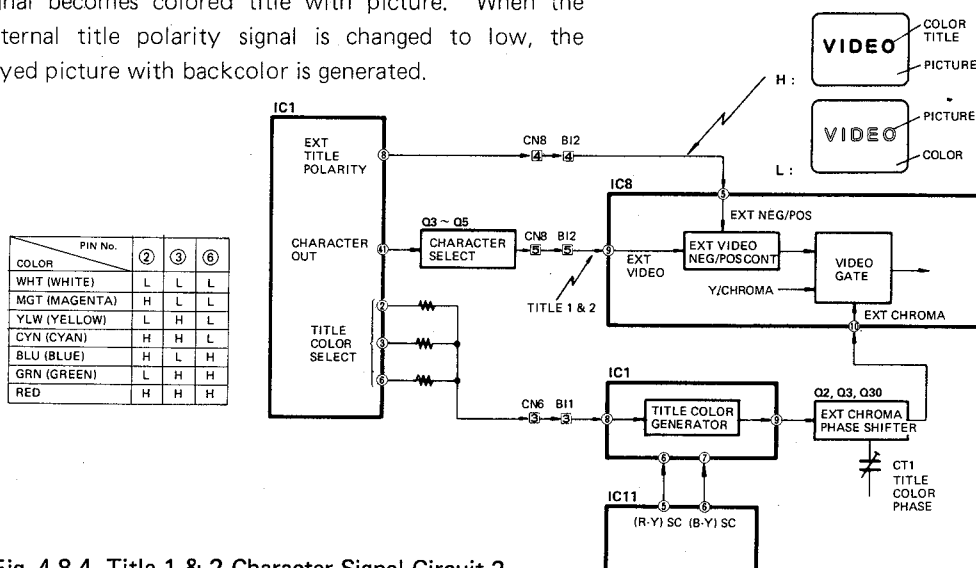


Fig. 4-8-4 Title 1 & 2 Character Signal Circuit-2

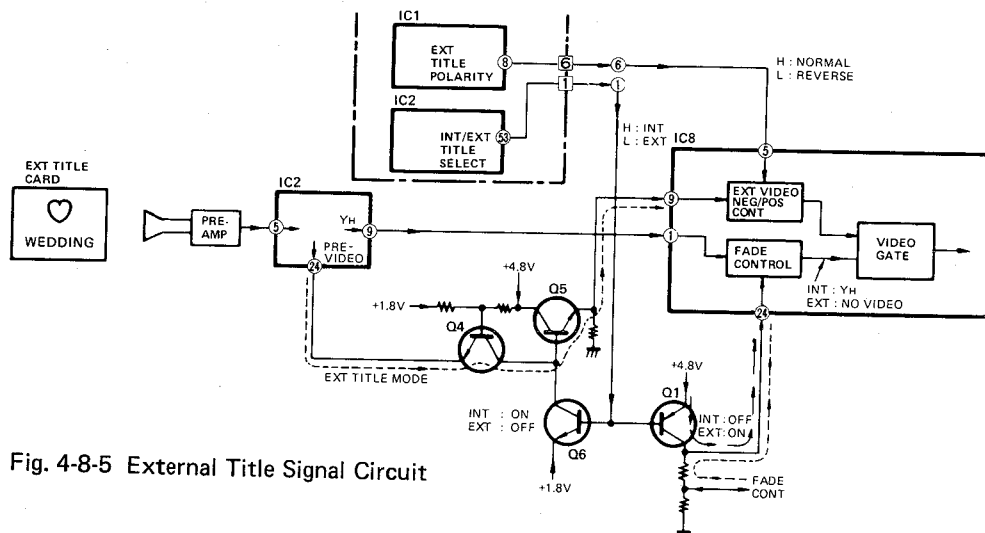


Fig. 4-8-5 External Title Signal Circuit

When the external title (EXT TITLE) mode is selected, the INT/EXT TITLE SELECT signal from pin 53 of IC2 on Microprocessor board is changed from high (INT) to low (EXT) and it is supplied to both bases of Q1 and Q6 on Process board so that Q1 is turned ON and Q6 is turned OFF.

The external title video signal from Preamplifier board through pins 5 and 24 of IC2 on Process board is fed to pin 9 of IC8 through Q4 and Q5.

The external title video signal is then supplied to EXT NEG/POS CONT circuit in IC8 where its polarity is controlled by the external title polarity signal fed from pin 8 of IC1 on Microprocessor board through pin 5 of IC8 on Process board.

The external title video signal is then applied to the video gate circuit.

However, YH signal from pin 9 of IC2 on Process board is shut off by the high voltage supplied from the collector of Q1 to pin 24 of IC8 and fade control circuit by turned ON Q1.

Since the circuit designing of video gate circuit in IC8 on Process board, the luminance (Y) signal level of title color signal inserted is always the same level even if the different color is selected.

As a result, especially red and blue title colors become different colors (too high luminance). Therefore, title color correction circuit reduces the luminance level of red and blue title color.

When red or blue title color is selected, the high level of title color correction signal supplied from Microprocessor board is fed to the base of Q8 so that Q8 turns OFF and Q9 turns ON. The positive polarity blanking pulse (BL) generated at pin 13 of IC11 is converted into the negative polarity by Q9 and is mixed to the base of Q12 and pin 1 of IC8. The Y signal blanking level at pin 1 of IC8 becomes bigger than that of without correction. The title color signal is then mixed with Y signal whose blanking/pedestal level corrected at the video gate circuit. Next, the negative polarity mixed signal obtained at pin 6 of IC8 and the negative polarity blanking signal are mixed at the base of Q12 to cancel the blanking level which is previously corrected at pin 1 of IC8. As a result, the blanking level of Y signal does not change by title color correction but that of red and blue title color are reduced for produce the better color.

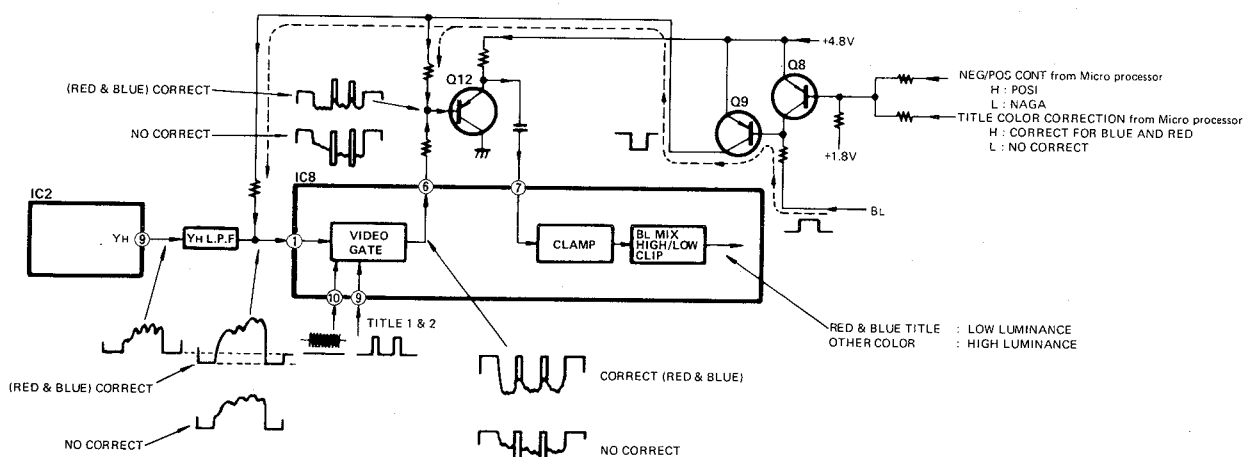


Fig. 4-8-6 Title Color Correction Circuit

The PAL signal at pin 13 of IC8 is supplied to the VTR. The PAL signal is also supplied to 4.43MHz trap CF8 where the chrominance signal is removed and the luminance signal remains. The luminance signal is then fed to the electronic viewfinder through the Deflection board.

4-10 White Balance Setting Circuit

Outline

This circuit automatically sets the white balance of picture by controlling the amplitude of red and blue signals respectively. (Proper white balance or color balance means that the camera will reproduce a white object in the picture as white.)

Since the scene illumination contributes to color in balance, a diffusion filter is placed between the lens and the pick-up tube when the white set switch is placed in the SET position. Therefore, white setting uses the same light as will be used later.

When the SET position is chosen, the automatic cycle in the camera increases or decreases R and B signals in step and stops when each of these levels is equal to the green (Y_L) level. At this point, the R- Y_L and B- Y_L signals are both 0(zero), the picture is white and white balance has been achieved.

This is indicated by the graphics displayed in the viewfinder. The blinking graphics WHITE will be displayed after the power switch is turned ON and while the white balance is being set. The graphics WHITE BAL OK is displayed or blinking WHITE disappears when the automatic white balance process is finished.

Details

The DC voltage obtained at pin 8 of Z4 and pin 8 of Z1 are supplied to the gain control circuit in the R- Y_L and B- Y_L signal circuits through pin 7 and pin 6 of CN7 to set the initial gain of R and B signals respectively. As a result, the R signal and B signal levels are set and camera will produce average white balance for 3200°K illumination when the power is first applied.

At this time, the blinking graphics WHITE is displayed on the viewfinder. When the graphics are displayed, the white balance should be set by placing the white set switch SW1 on the side of camera to the SET position while aiming the camera at the white object or white paper.

When the white set switch SW1 is placed to the SET position, pin 1 of IC3 is connected to ground, the 6-bit up/down counters start counting up or down depending on the levels at pin 2 and pin 7 of IC4. As the counters count up or down the digital/analog (D/A) converter consisting of Z3/Z4 and Z1/Z2 produce staircase signals. The voltage levels of these D/A converter will set the R and B gain.

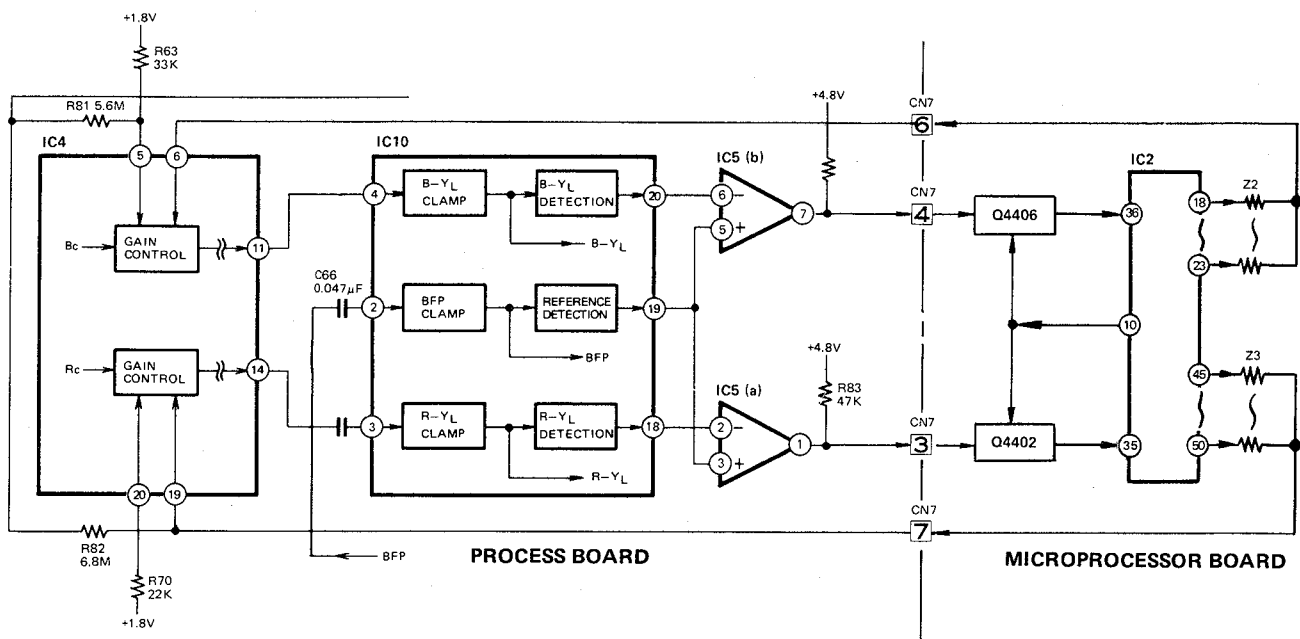


Fig. 4-10 White Balance Setting Circuit

These DC voltages are sent to the gain control circuit in IC4 and control the R and B signal levels which was initially set for 3200°K illumination. As the increasing or decreasing voltages made by the stairsteps raise the gain of R and B channels, the levels of R-Y_L and B-Y_L signal increase or decrease at pins 14 and 11 of IC4. To determine for the up/down counters counting up or down, an Op-amp for each channel (IC5 pins 5, 6, 7 for blue, pins 1, 2, 3 for red) compares the detected signal levels (DC) which appear at IC10 (pin 18 : R-Y_L detected DC, pin 20 : B-Y_L detected DC, pin 19 : reference detected DC). The outputs of comparison at pin 7 and pin 1 of IC5 are sent to the microprocessor through pins 3 and 4 of CN7.

The output of comparator at pin 7 is high when the R signal level is below the Y_L signal (The R-Y_L detected DC level is below the reference detected DC level.), and the counter starts counting up.

The increased DC voltage from the D/A converter is fed to the red gain control circuit to increase the red signal level.

When the R signal just exceeds the Y_L signal, the comparator switches its output to low and the counter starts counting down. The decreased DC voltage reduces the R signal level. This loop works until the R signal level is equal to the Y_L signal. The B channel works in a similar fashion.

The counters stop counting automatically about 3 seconds after the white set switch SW1 is placed to the SET position and white balance has been achieved. At the same time, the blinking graphics WHITE goes OFF from the viewfinder or the graphics WHITE BAL OK are displayed.

Since the diffusion filter has itself an inherent color filtering effect, the white balance shifts slightly when the white setting is accomplished and diffusion filter is removed.

When the white setting is accomplished and the white set switch is placed in the normal mode the gains are returned to the previous mode for an almost exact match.

4-11 VTR Remote Control/Fade Control Circuit

This circuit consists of the VTR remote control circuit and the fade control circuit.

4-11-1 VTR Remote Control Circuit

Outline

This circuit generates VTR start/stop (pause) control signal. When the VTR is set to the recording mode, the VTR is started by a high potential from this circuit. If a low potential is sent to the VTR, it stops (pauses). This circuit also has the VTR compatibility switch for other VTR which is started by a low potential and stopped by a high potential.

Details

When the VTR compatibility switch SW3 is set in the + (normal) position and the VTR is set in the recording mode if the power switch is turned ON, the potential at pin 17 and pin 19 of IC1 are set to high respectively by the reset pulse supplied to pin 7 of IC1 from Micro-processor. The high at pin 17 is fed to the Microprocessor board and the graphics REC is not displayed in the viewfinder.

The high at pin 51 of IC2 (Microprocessor) is supplied to the base of Q13 so that Q13 turns ON. The low obtained at the collector of Q13 is supplied to VTR through pin 6 of camera cable to set the VTR to REC/PAUSE mode.

When the non-lock type VTR start/stop switch SW701 is depressed (refer to 1ST TRIGGER), the negative trigger pulse is generated. It is fed to pin 1 of IC4 through Q17. The low at pin 51 of IC2 is fed to Q13 and the high at the collector of Q13 is fed to the VTR to start recording.

At the same time, the low at pin 17 of IC1 is sent to the Micro processor board and the blinking graphics REC is displayed in the viewfinder.

When the subsequent trigger pulse is sent to pin 1 of IC4 by depressing SW701 again (refer to 2ND TRIGGER), the potential at pin 51 of IC2 and pin 17 of IC1 is inverted. As a result, the VTR is stopped and the blinking REC graphics go OFF.

The VTR compatibility switch SW1 inverts the potential of VTR recording control signal at pin 51 of IC2 for other VTR which starts with low potential and stops with high potential.

When the portable VTR is set to the playback mode, an inhibit (Tally) signal (high level) from the VTR is supplied to pin 37 of IC2 to inhibit the trigger pulse from the VTR start/stop switch SW701. Therefore, the REC graphics are not displayed in the viewfinder. This condition is maintained until the playback mode is released and set to the recording mode again.

When the standby switch on the side of the camera is set to the standby mode, the high potential is fed to the base of Q21 from the collector of Q12 for setting the potential at pin 6 of VTR cable to low. Also the high potential at the collector of Q12 is supplied to pin 5 of camera cable through Audio/Lens Control board to set the VTR to standby mode. The condition is maintained until the standby switch is reset to the ON position.

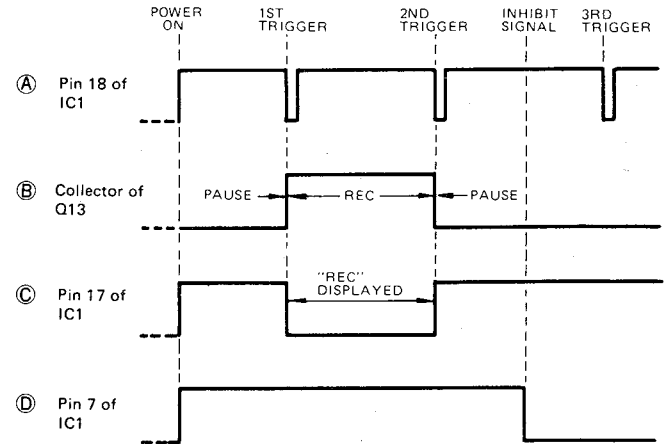


Fig. 4-11-1 VTR Remote Control

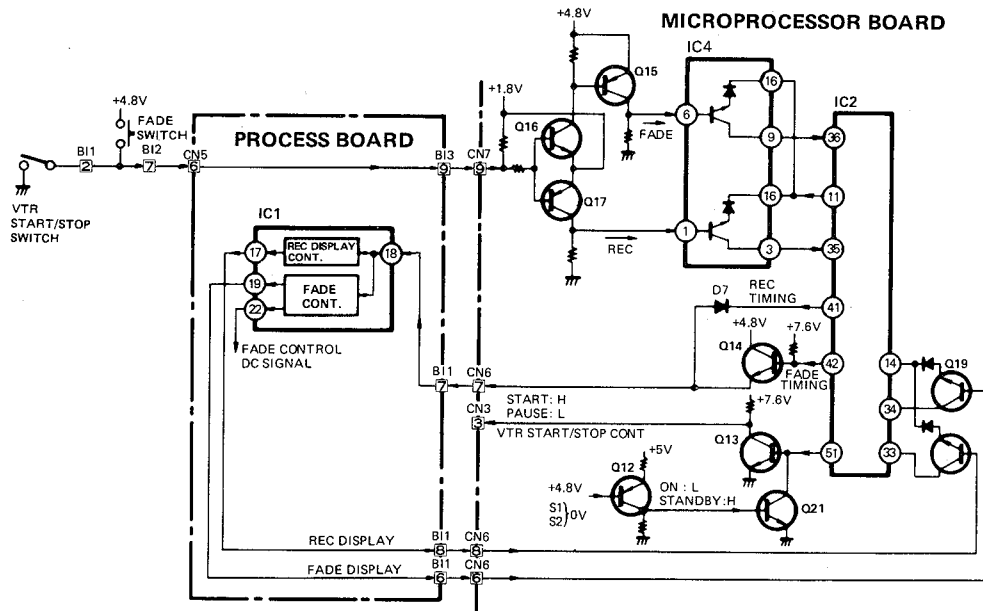


Fig. 4-11-2 VTR Remote Control/Fade Control Circuit

4-11-2 Fade Control Circuit

Outline

This circuit generates the fade control signal and sends it to the video signal processing circuit and Audio circuit to control the fade-in/out effects.

When the VTR is in recording mode, if the VTR start/stop switch is depressed after pressing the fade switch, the fade-out effect is obtained and the VTR pauses, then the picture appears again.

If the VTR is in pause, depressing the VTR start/stop switch after pressing the fade switch, the video will fade out, the VTR starts recording and the video fades in again.

If the VTR start/stop switch is depressed without pressing the fade switch, no fade effect occurs and the VTR is remote-controlled as described in VTR remote control circuit.

Details

. Fade-in effect

When the momentary fade switch SW2 is depressed (E , 1ST TRIGGER), the DC level at pin 18 of IC1 becomes high. This high level initiates the fade/rec control circuit in IC1. This trigger signal E changes the potential at pin 19 of IC1 from high to low J. The low level is fed to the Microprocessor board and the graphics F is displayed in the viewfinder. Then when the VTR start/stop switch SW701 is depressed (F , 1ST TRIGGER), pin 18 of IC1 goes low and the DC level at pin 22 starts increasing gradually (H).

After about few seconds the potential at pin 51 of IC2 (Microprocessor) becomes low (L) and the collector of Q13 becomes high to set the VTR starts recording. The potential at pin 17 of IC1 goes low (K) and it is fed to the Microprocessor board to display the blinking graphics REC in the viewfinder. Simultaneously the DC level at pin 22 starts decreasing gradually. This DC level H at pin 22 is fed to the fade control circuit in the video signal processing circuit to control the video signal level (I).

This means that the VTR start/stop switch is pressed, the video signal is decreased gradually at first and then appears again gradually (fade-in effect) after recording starts. Therefore the recording proceeds as shown M . When the fade-in effect is completed, the potential at pin 19 of IC1 is changed from low to high (J) and the graphics F goes OFF.

If the VTR start/stop switch SW701 is depressed independently after fade-in effect is accomplished (F , 2ND and 3RD TRIGGER), the VTR can be controlled remotely as previously described in VTR remote control circuit.

If the fade switch SW2 is depressed again after it is initially pressed (E , 3RD and 4TH TRIGGER), the initial setting for fade effect will be cancelled.

. Fade-out effect

As in the case of fade-in effect, if the VTR start/stop switch SW701 is depressed (F , 4TH TRIGGER) after pressing the fade switch SW2 (E , 2ND TRIGGER), the DC level at pin 22 of IC1 starts increasing gradually to fade-out the video. After few seconds, the potential at pin 51 of IC2 (Micro Processor) changes from low to high and VTR stops (pauses). This DC level decreasing gradually at pin 22 is fed to the fade control circuit to control the video signal level.

When the VTR start/stop switch is pressed after depressing the fade switch, the picture disappears at first (fade-out effect), VTR pauses and then the picture appears again gradually for next recording.

When the VTR stops, both the graphics REC and F disappears from the viewfinder.

When the portable VTR is set to the playback mode or the standby switch is set to the standby position, pin 7 of IC1 becomes low and the fade/rec control circuit is reset as described in VTR Remote Control Circuit. Therefore the fade/rec control circuit is not controlled by depressing the VTR start/stop switch and the fade switch.

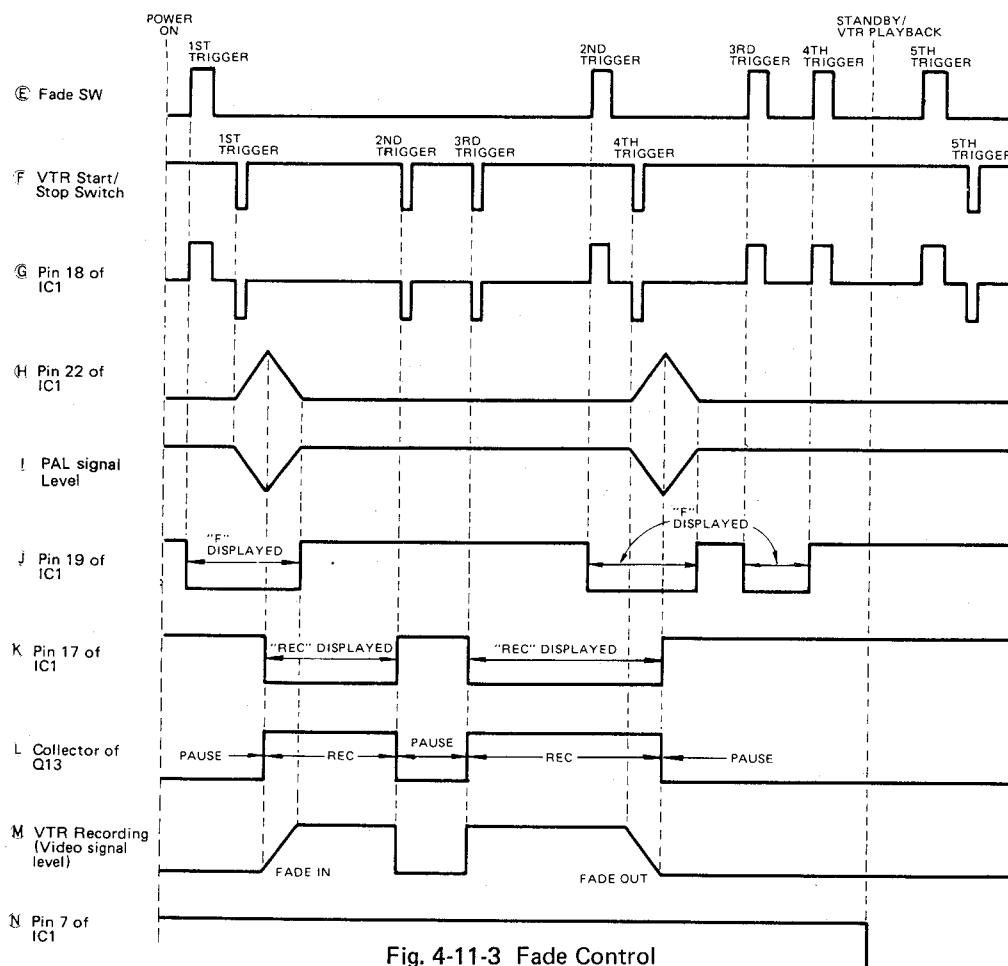


Fig. 4-11-3 Fade Control

5 Micro Processor Board

5-1 Micro Processor	55
5-2 Input Interface	60
5-3 Character Generator	60

5-1 Micro Processor

Outline

The microprocessor IC2 generates the programmed key scan pulse signals from the output ports of IC2 and receives these signals at the input ports of IC2 through the input interface circuits.

According to the input signals, the microprocessor IC2 supplies the instructional signals to the character generator IC1 and also transmits or receives serial data from/to VTR for VTR remote control and displaying characters.

Serial data transmission

When the color video camera WVP-G1 is used with the portable video cassette recorder NV-100 or NV-180, the serial data transmission system is performed between the both equipments through 10 pin VTR connector. The signals which are exchanged between the two equipments through 10 pin connector is as shown in Fig. 5-1-1.

Pin	CAMERA	DIRECTION
1	Video OUT (REC) Video IN (P.B)	VTR ↔ CAMERA
2	GND for pin 1	VTR → CAMERA
3	Serial Data IN/OUT	VTR ↔ CAMERA
4	Serial Clock IN	VTR → CAMERA
5	STANDBY (H) / AUDIO (CH2 (R)) OUT	VTR ← CAMERA
6	CAMERA PAUSE (L)	VTR ← CAMERA
7	Audio (CH1 (L)) OUT	VTR ← CAMERA
8	GND for Audio	VTR → CAMERA
9	GND for pin 10	VTR → CAMERA
10	+12V	VTR → CAMERA

Fig. 5-1-1 10 pin Connector Signal

The serial clock signal is a reference signal which is used to control the timing of the data transmission between camera and VTR.

The serial clock signal is produced by VTR's micro-processor and supplied to camera's microprocessor IC2 as shown in Fig. 5-1-2.

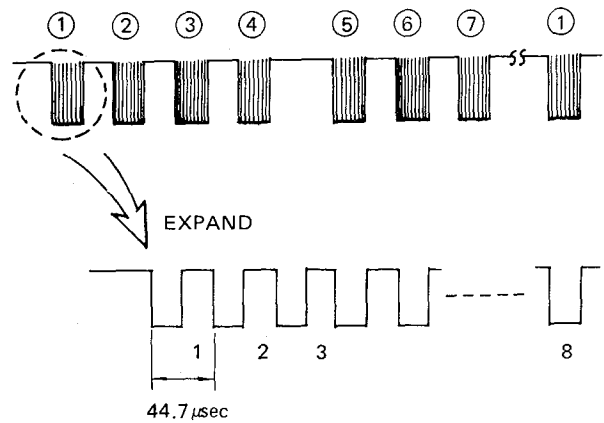


Fig. 5-1-2 Serial Clock

The serial clock signal has seven transmissions, and each transmission consists of 8 bit pulses.

During each transmission, the 8 bit serial data is exchanged as shown in Fig. 5-1-3.

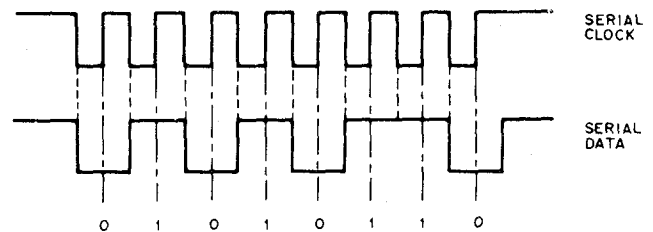


Fig. 5-1-3 Serial Data

The informations are converted into 8 bit logic data inside microprocessor IC2. And for example, the coded data (Serial Data) is (0.1.0.1.0.1.1.0) and the timing chart between the serial data and the serial clock as shown in Fig. 5-1-3.

No.	DATA TRANSMISSION	
①	CAMERA → VTR	• MEMORY ON/OFF
②	TUNER → VTR	• REC/P.B SELECT
③	WIRED REMOTE CONTROLLER → VTR	• VTR P.B REMOTE CONTROL
④	INSIDE VTR	
⑤	VTR → CAMERA CAMERA TUNER WIRED REMOCON	• BATTERY LEVEL
⑥	VTR → CAMERA	• TAPE COUNTER
⑦	VTR → CAMERA	

Fig. 5-1-4 Serial Data Transmission

The following serial data is supplied from the VTR to the camera during the transmission (5), (6) and (7) as;

- Battery level
- Tape counter display (Number, Memory : M)

The following serial data is supplied from the camera to the VTR during the transmission (1) as;

- Tape counter control (Reset, Memory ON/OFF)
- Remote control of playback (PLAY, SLOW, CUE, REVIEW, INS)
- REC/Playback selection signal

Details

The pin identifications and functions of the micro processor, IC2 is described in the Table 5-1.

IC2 MN1554 CVG

Pin Identifications

Pin No.	Name	IN/OUT	Descriptions
1	P12	OUT	F-VTR Display (F-VTR = L) F-VTR = Portable VTR with CAMERA SELECT Switch
2	P13	OUT	Tally Cancel Signal (F-VTR only)
3	SYNC	OUT	Not Used
4	SIRQ	IN	V.SYNC Input
5	IRQ	IN	Serial Clock (Inverted) Input
6	SBT	IN	Serial Clock Input
7	SBO	OUT	Serial Data Output
8	SBI	IN	Serial Data Input
9	RST	IN	Reset Pulse Input
10	P20	OUT	Key Scanning Pulse Output Data Output for DAO (20) of MN1237 (IC1)
11	P21	OUT	Key Scanning Pulse Output Data Output for DA1 (22) of MN1237 (IC1)
12	P22	OUT	Key Scanning Pulse Output Data Output for DA2 (23) of MN1237 (IC1)
13	P23	OUT	Key Scanning Pulse Output Data Output for DA3 (25) of MN1237 (IC1)
14	P30	OUT	Key Scanning Pulse Output Data Output for DA4 (28) of MN1237 (IC1)
15	P31	OUT	Key Scanning Pulse Output Data Output for DA5 (29) of MN1237 (IC1)
16	P32	IN	Battery Warning-1 Input (CAMERA ITSELF)
17	P33	IN	Battery Warning-2 Input (CAMERA ITSELF)
18	P40	OUT	Automatic White Balance (B) 5 (LSB) INITIAL (H)
19	P41	OUT	Automatic White Balance (B) 4 (H)
20	P42	OUT	Automatic White Balance (B) 3 (L)
21	P43	OUT	Automatic White Balance (B) 2 (L)
22	P50	OUT	Automatic White Balance (B) 1 (L)
23	P51	OUT	Automatic White Balance (B) 0 (MSB) (H)
24	P52	OUT	Playback DC Output (Playback = H)
25	VDD	IN	+5V DC Power Input
26	PC0	OUT	Battery Warning Output (Normal = L, NG = H, L, H, L)
27	PC1	OUT	Title Color Correction Output (Blue, Red = H, else = L)
28	P53	OUT	INT/EXT Title Select (INT = H, EXT = L)
29	P60	IN	Key Scanning Pulse Input
30	P61	IN	Key Scanning Pulse Input
31	P62	IN	Key Scanning Pulse Input
32	P63	IN	Key Scanning Pulse Input
33	P70	IN	Key Scanning Pulse Input
34	P71	IN	Key Scanning Pulse Input
35	P72	IN	Key Scanning Pulse Input
36	P73	IN	Key Scanning Pulse Input
37	P80	IN	Serial Clock (Tally Detect) Input
38	P81	IN	Camera Power ON/OFF Detect Input (ON = H, OFF = L)
39	P82	IN	Timer Count Pulse (60 Hz = V.pulse) Input
40	P83	IN	Standby Detect Input (ON = L, Standby = H)
41	P90	OUT	REC Timing Pulse Output
42	P91	OUT	FADE Timing Pulse Output
43	P92	OUT	REC RESET Pulse Output
44	P93	OUT	NEGA/POSI Select Output (NEGA = L, POSI = H)
45	PA0	OUT	Automatic White Balance (R) 5 (LSB) INITIAL (L)
46	PA1	OUT	Automatic White Balance (R) 4 (L)
47	PA2	OUT	Automatic White Balance (R) 3 (H)
48	PA3	OUT	Automatic White Balance (R) 2 (L)
49	PB0	OUT	Automatic White Balance (R) 1 (H)
50	PB1	OUT	Automatic White Balance (R) 0 (MSB) (L)
51	PB2	OUT	REC START/PAUSE Control Output (Start = L for PANASONIC)
52	PB3	OUT	REC Display Output (REC = H, PAUSE = L)
53	OSC	OUT	Clock Pulse Generator
54	OSC	IN	Clock Pulse Generator or Clock Pulse Input
55	TC1	IN	H. SYNC or 32.768 KHz Pulse Input (Power ON = H. SYNC)
56	TC1	OUT	Timer Pulse Generator
57	Vss	---	Ground
58	P00	OUT	Timer Count Select Output (ON = L, STBY/Power OFF = H)
59	P01	OUT	Title Mask pulse Output (Title 1,2 only)
60	P02	OUT	V. SYNC Output
61	P03	OUT	Power Control Output (Power OFF = H, ON = L)
62	PC2	OUT	AWC Warning Output (OK = L, NG = Blink (0.4 sec), Setting = Blink (0.2 sec))
63	P10	OUT	ADM Output for MN1237 (IC1)
64	P11	OUT	LDI Output for MN1237 (IC1)

Table 5-1 Pin Identification of IC2 (Microprocessor)

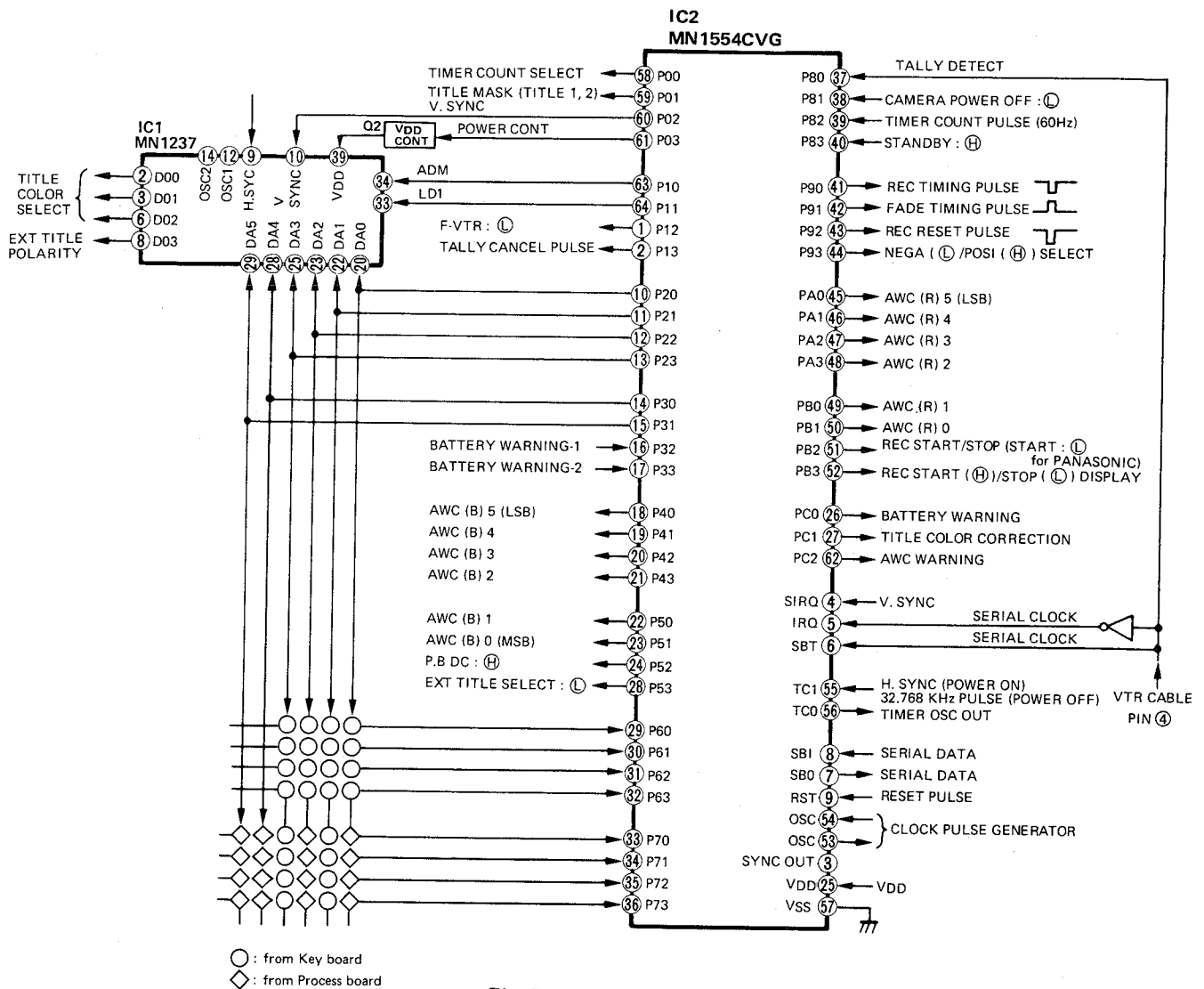


Fig. 5-1-5 Block Diagram of Microprocessor Circuit

IC1 MN1237

Pin Identifications

Pin No.	Name	Description
1	VOB	Character Background Signal Output
2	DO0	Title Color Select-0 Out
3	DO1	Title Color Select-1 Out
6	DO2	Title Color Select-2 Out
8	DO3	Key Polarity Select Out
9	H. SYNC	H. SYNC Input
10	V. SYNC	V. SYNC Input
12	OSC 1	Clock Pulse Generator
14	OSC 2	
15	Vss	Ground
20	DA0	Data Input Bus-0
22	DA1	Data Input Bus-1
23	DA2	Data Input Bus-2
25	DA3	Data Input Bus-3
28	DA4	Data Input Bus-4
29	DA5	Data Input Bus-5
31	DA6	Data Input Bus-6
33	LDI	Strobe Pulse Input
34	ADM	Address Mode Select Input
35	TST	Test Input Connected to Ground
39	VDD	+5V Power Supply Input
41	VOW	Character Signal Output

Table 5-2 Pin Identification of IC1

IC2 Pin 16	IC2 Pin 17	DISPLAY
1	0	E - - - - F
1	1	E - - - F
0	1	E - - F
0	0	E - F

IC1 MN1237

TITLE COLOR SELECT

DO0	DO1	DO2	TITLE COLOR
0	0	0	WHT (White)
1	0	0	MGT (Magenta)
0	1	0	YLW (Yellow)
1	1	0	CYN (Cyan)
0	0	1	(CYN (Cyan))
1	0	1	BLU (Blue)
0	1	1	GRN (Green)
1	1	1	RED (Red)

DO3 (KEY POLARITY OUT (EXT NEGA))
NORMAL : H
REVERSE : L

IC2
MN1554CVG

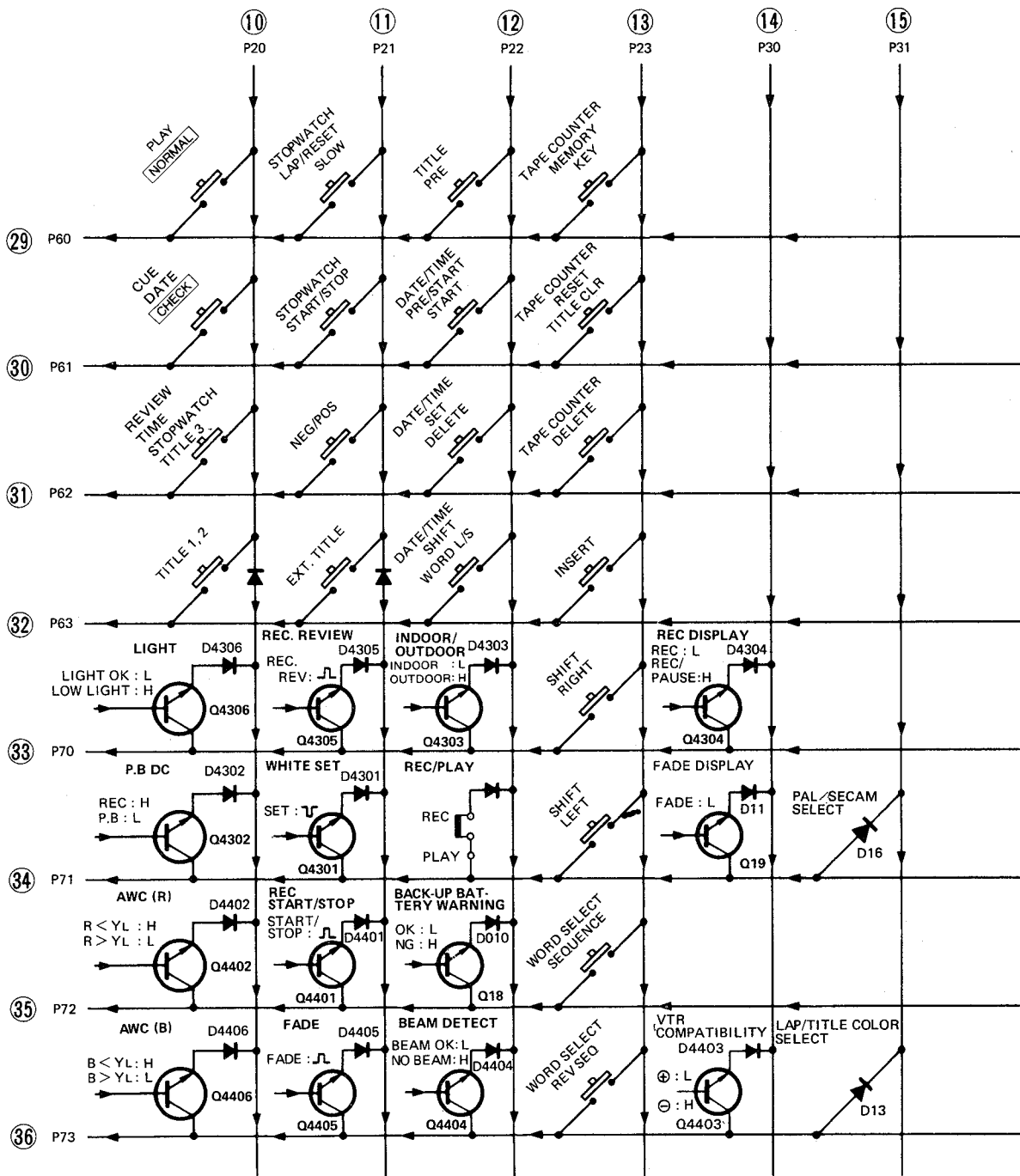


Fig. 5-1-6 Input Matrix Circuit

The programmed signals (key scan pulse) are supplied from output ports P20, P21, P22, P23, P30 and P31 to input interface circuits.

Then, these programmed signals are supplied from input interface circuits to input port P60, P61, P62, P63, P70, P71, P72 and P73 switches and transistors. (Refer to 5-2, Input Interface)

According to the programmed signals at input port P60, P61, P62, P63, P70, P71, P72 and P73, and the signal at input port P32 and P33, the microprocessor identifies the instruction with the signal flow route at input interface circuit and supplies the instructional signals (P20 - P23, P30 - P31) to character generator, IC1. The serial clock pulse is supplied from VTR to pin 5 (IRQ) and pin 6 (SBT) of IC2 to match the timing for data transmitting and receiving to/from VTR.

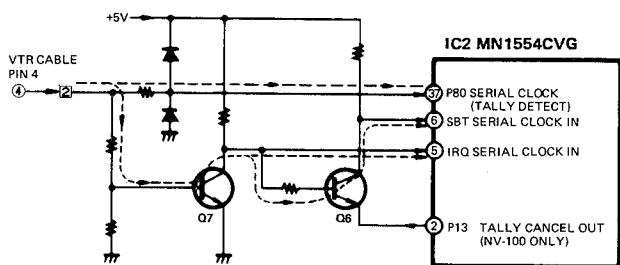


Fig. 5-1-7 Serial Clock Circuit

The serial data is fed from VTR to pin 8 (SB1) of IC2 so that the microprocessor identifies the instruction from VTR. Also the serial data is sent from pin 7 (SBO) of IC2 to VTR through inverter Q8. (Fig. 5-1-5)

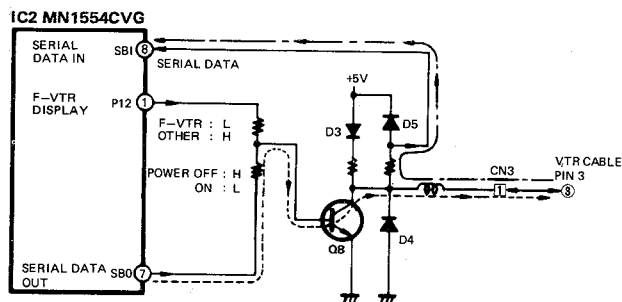


Fig. 5-1-8 Serial Data Circuit

The 50Hz clock pulse (Timer Count Pulse) generated by the wide blanking (W.BL) pulse at Sync-1 board for the stopwatch function is supplied to pin 39 (P82) of IC2 the standby switch is placed ON position.

The V. sync pulse is fed from sync separation circuit on the Deflection board to pin 4 (SIHQ) of IC2 to control the vertical timing.

The character select circuit is shown in Fig. 5-1-9. When the either title-1 or title-2 characters are displayed on EVF screen, the character select circuit is functioned. Because the character select circuit in IC5 on Deflection board makes separation depend on the vertical location of character signals. Therefore, the upper half of either title-1 or title-2 character is only displayed in the EVF and lower half of that can be recorded and also displayed in the EVF.

The character select circuit is functioned so that the title-1 and 2 can be recorded to VTR.

The title mask signal is supplied from pin 59 (PO1) to the both bases of Q1 and Q5 as shown in Fig. 5-1-9.

During the title mask pulse is high period, the character signal from pin 41 of IC1 is fed to IC5 on Deflection board through Q1.

During the title mask pulse is low period, the character signal is sent to IC8 on Process board through Q3 and Q4.

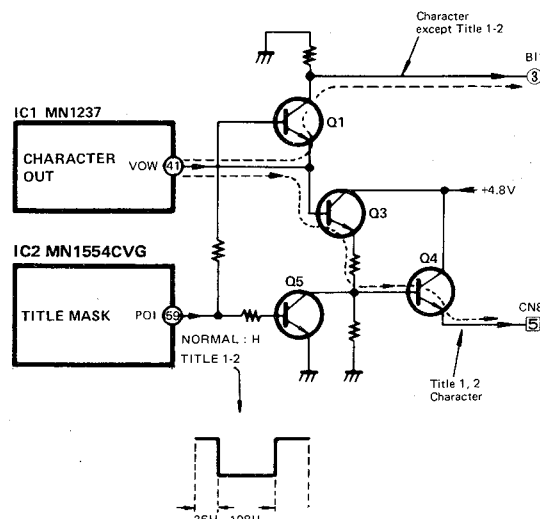


Fig. 5-1-9 Character Select Circuit

The REC Reset (fade reset) signal is sent from pin 43 (P92) of IC2 to rec control circuit on Process board so that fader mode is reset when the camera is set to fade-in/out mode.

The REC Timing signal is fed from pin 41 (P90) of IC2 to rec control circuit on process board to protect the misoperation of the fade-in/out mode by the noise of electrostatics by controlling the fade-in/out timing. The FADE Timing signal is also supplied from pin 42 (P91) of IC2 to rec control circuit on process board for the same reason and purpose.

The NEGA/POSI control signal is applied from pin 44 (P93) of IC2 to video signal processing circuit on process board so that the normal(positive) picture is appeared when camera is aimed to negative color film.

Camera power detect circuit consisting of Q34 and Q9 detects whether the camera power is supplied or not and sends the information to pin 38 of IC2.

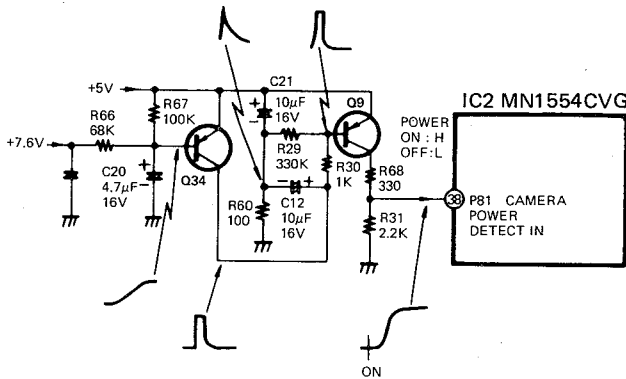


Fig. 5-1-10 Power Detect Circuit

Then, IC2 sends out the power control signal from pin 61 of IC2 both base of Q30 and Q2.

When the camera is operated normally, Q30 and Q2 are turned ON so that +5V DC is supplied to other circuit. When the camera power is cut off, Q30 and Q2 are turned OFF so that +5V DC is not supplied to other circuit except IC2 in order for longer battery life.

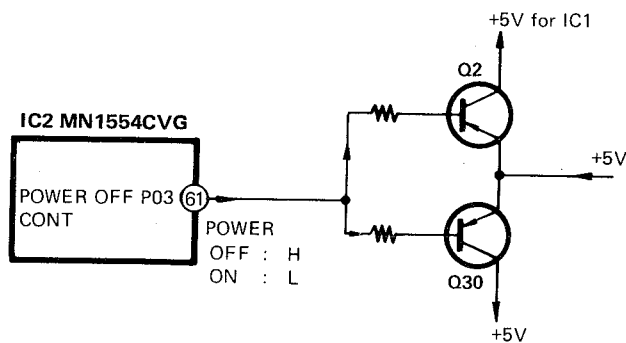


Fig. 5-1-11 Power Control Circuit

5-2 Input Interface Circuit

The input interface circuits consist of the two blocks as;

- EVF Display Board Circuit
- Camera Conditions Sensor Circuit

and these are constructed in the matrix circuit.

The output ports and input ports of the microprocessor is incorporated with the matrix circuit.

The programmed signals (key scan pulses) are supplied from the output ports P20 - P23, P30 - P31 to the matrix circuit so that the programmed signals are returned to the input ports P60 - P63, P70 - P73 through diodes/switches, in the matrix circuit.

The microprocessor, IC2 will know the function of the camera by detecting the returned programmed signal. According to the signals at the input ports of the micro-processor, IC2, the microprocessor supplies the graphics instructions to the character generator, IC1 and the remote control instructions to VTR.

5-3 Character Generator

The clock pulse frequency of IC1 is adjusted by VR1 (CHARACTER SIZE).

The display characters are separated into the three categories as;

- (1) A : Cannot be recorded and only display on the EVF.
- (2) B : Can be recorded and supplied to VTR recorder except title-1 & 2.
- (3) C : Title-1 & 2 (can be recorded)

The character (A + B) at pin 41 (VOW) of IC1 is supplied through Q1 to pin 16 of IC5 on the deflection board.

The character (A + B) is separated into the graphics (A) and graphics (B) inside IC5 on the deflection board. The graphics (B) is fed from pin 14 of IC5 on deflection board to process board and mixed with the video signal inside IC8 on the process board. Then PAL signal (video + C + B) is supplied from pin 13 of IC8 to VTR through pin 1 of CN101 VTR cable. Also PAL signal (EVF video + C + B) is supplied from pin 13 of IC8 through the trap (CF8) and pin 18 of IC5 on the deflection board.

The signal (EVF video + C + B) is mixed with the graphics (A) inside IC5 on the deflection board so that the signal (EVF video + C + B + A) is supplied from pin 24 of IC5 to viewfinder.

6. Audio/Lens Control Board

6-1. AIC amplifier

Outline

The AIC amplifier receives AIC detect signal from process board and drives lens iris in order to keep video output level constant.

Details

AIC amplifier consists of IC1(a) and IC1(b).

The AIC detect signal is supplied from signal processing circuit on process board to pin 6 (–) of IC1 and amplified by IC1(b). Then it is sent from pin 7 of IC1 to drive coil of lens iris in order to open/close lens iris. In addition to this, the beam detect signal from deflection board is fed to pin 6 of IC1 in order to close the lens iris during the beam current is insufficient.

The induced voltage (it is occurred by moving lens iris inside the damper coil.) is fed from lens damper coil to pin 3 (+) of IC1 and amplified by IC1(a). Then amplified signal is fed from pin 1 of IC1 to pin 6 of IC1 to damp the lens iris hunting.

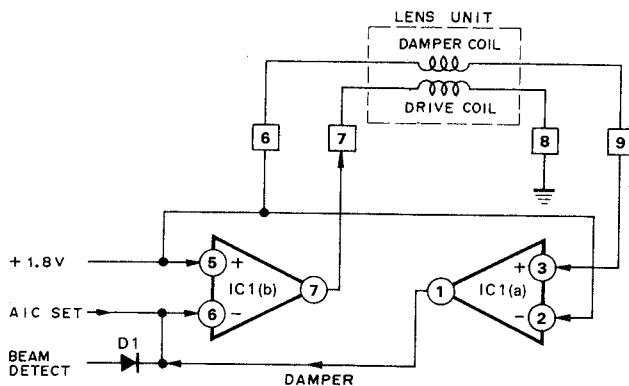


Fig. 6-1 AIC Amplifier Circuit

6-2. Zoom Control Circuit

Outline

This circuit drives zoom lens motor.

Details

When the TELE switch SW1 on the handle grip is depressed, the base of Q4 is shorted to the ground and turn ON Q4 and Q1. Therefore, the current flows into the zoom motor through Q1 and Q4 for zoom-in (telephoto) operation.

When the WIDE switch SW2 is depressed, Q2 and Q3 turn ON. Therefore, the current flows into the zoom motor (in the reverse direction) through Q3 and Q2 for zoom-out (wide angle) operation.

SW2 on the FADE/AGC SWITCH board is a zoom speed switch to set the zoom speed by changing the DC voltage at the both bases of Q2 and Q4.

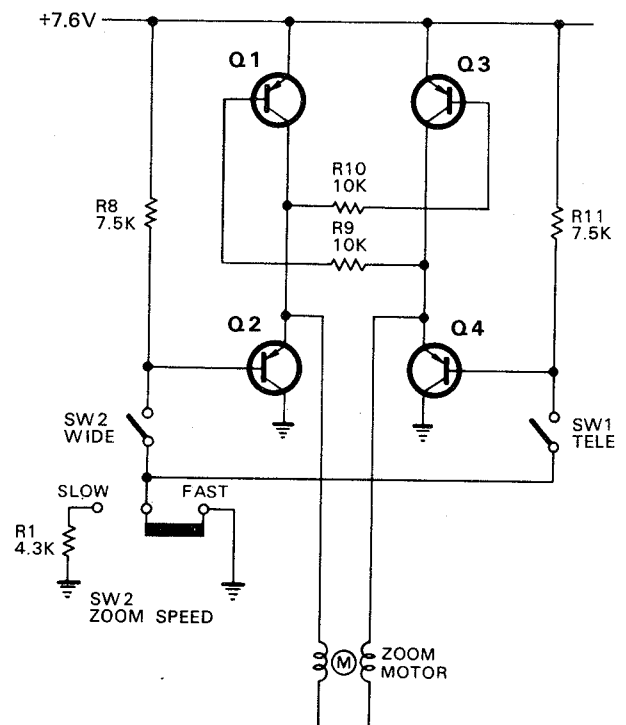


Fig. 6-2 Zoom Control Circuit

Outline

The amplified audio signal is sent out to the VTR for recording and to the earphone jack on the rear of the camera for audio monitoring.

Details

The -20dB audio output at pins 1 (CH1) & 7 (CH2) of IC2 are sent directly to the portable VTR or via power supply to the table model VTR through terminal No. 3 (CH1) & 2 (CH2) of CN7 and terminal No. 7 (CH1) & 5 (CH2) of VTR connector CN101, and earphone jack JK1 through terminal No. 3 (CH1) & 2 (CH2) of CN8.

The audio signal level is also controlled by the fade control signal supplied from Process board through Q5.



7 Correction Board

The Correction Board contains following circuits.

- 7-1 Vertical Sawtooth/Parabola Generator Circuit · 63
- 7-2 Horizontal Sawtooth/Parabola Generator Circuit · 63
- 7-3 Signal Shading Correction Circuit · 64
- 7-4 Dynamic Focus Correction Circuit · 64
- 7-5 Bias Light Shading Correction Circuit · 65

7-1 Vertical Sawtooth/Parabola Generator Circuit

Outline

This circuit generates the vertical sawtooth and parabola waveforms.

The vertical sawtooth and parabola signals are fed to dynamic focus correction, red shading correction and blue shading correction circuit.

Details

The vertical scanning start (Vs) pulse from the Sync-1 board enters the base of Q2 through pin 1 of B11. The Vs pulse is then fed to a miller integrator consisting of R2, C1 and IC1(a) to converted into a sawtooth signal. The V.sawtooth signal at pin 1 is also supplied to another miller integrator consisting of R3, C3 and IC1(b) to convert it into a parabola signal.

The V.sawtooth signal and the V.parabola signal are fed to dynamic focus correction, red shading correction and blue shading correction circuit.

7-2 Horizontal Sawtooth/Parabola Generator Circuit

Outline

This circuit generates the horizontal sawtooth and parabola waveforms. The horizontal sawtooth and parabola signals are fed to bias light shading correction, dynamic focus correction, red shading correction and blue shading correction circuit.

Details

The horizontal scanning start pulse(Hs) from the Sync-1 board enters the base of Q1 through pin 2 of B11. The Hs pulse is then fed to a miller integrator consisting of R24, C5 and IC2(a) and converted into a sawtooth signal.

The H.sawtooth signal at pin 1 is also supplied to another miller integrator consisting of R26, C7 and IC2(b) to convert it into a parabola signal.

The H.sawtooth signal and the H.parabola signal are fed to bias light shading correction, dynamic focus correction, red shading correction and blue shading correction circuit.

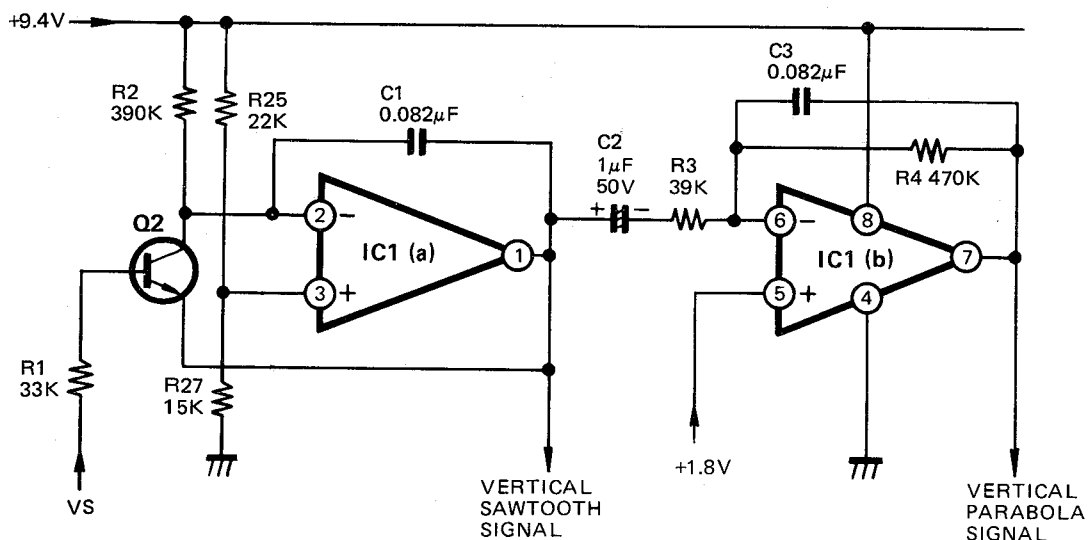


Fig. 7-1 Vertical Sawtooth/Parabola Generator Circuit

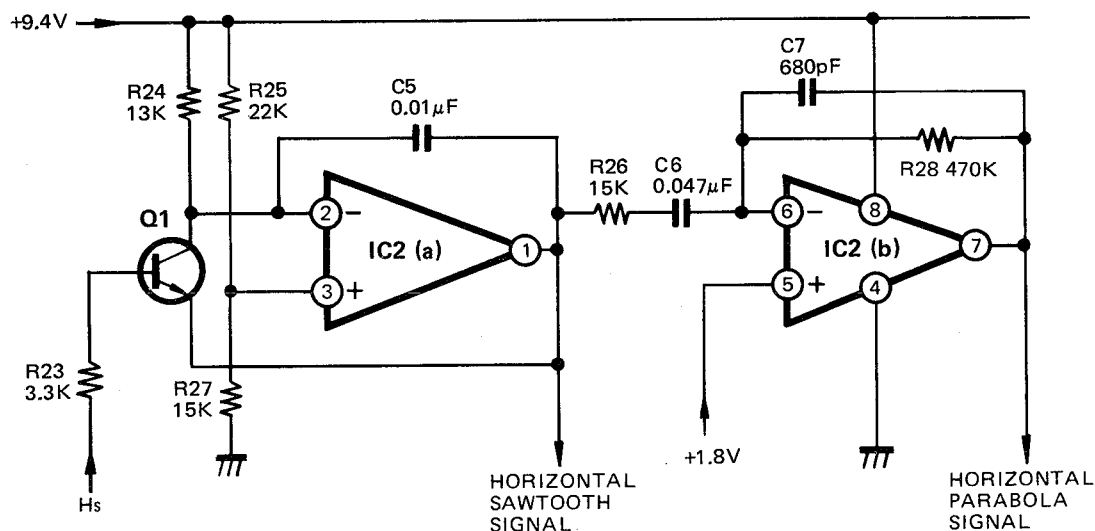


Fig. 7-2 Horizontal Sawtooth/Parabola Generator Circuit

7-3 Signal Shading Correction Circuit

Outline

This circuit receives horizontal(H) and vertical(V) of sawtooth and parabola signals and generates H and V shading correction signals which are fed to the Process board.

Details

o Red Shading Correction Circuit

The H parabola signal is fed to VR3 (R-H PARA) and the H sawtooth signal is fed to VR4 (R-H SAW). The V parabola signal is fed to VR1 (R-V PARA) and the V sawtooth signal is fed to VR2 (R-V SAW). These signals are controlled and mixed and supplied to IC3(b) to generate red shading correction signal. The output signal obtained at pin 7 of IC3(b) is supplied to red signal shading correction circuit in Process board through terminal 7 of B11.

o Blue Shading Correction Circuit

The H parabola signal is fed to VR7 (B-H PARA) and the H sawtooth signal is fed to VR8 (B-H SAW). The V parabola signal is fed to VR5 (B-V PARA) and the V sawtooth signal is fed to VR6 (B-V SAW). These signals are controlled and mixed and supplied to IC3(a) to generate blue shading correction signal. The output signal obtained at pin 1 of IC3(a) is supplied to blue signal shading correction circuit in Process board through terminal 6 of B11.

7-4 Dynamic Focus Correction Circuit

Outline

Generally, the focus voltage which brings the beam in focus in the center part of the pick-up tube is different in level from the voltage which brings the edge portions of the pick-up tube into best focus so that the modulation depth for the center part and the edge portions of the pick-up tube differ. When the camera is directed at an evenly illuminated white object, the red and blue signals modulated at 5MHz do not have a uniform level, and as a result, a color shading appears A.

The dynamic focus correction signal which contains the horizontal and vertical sawtooth and parabola signals is supplied to the pick-up tube's deflection electrode together with the deflection DC voltage to focus the electron beam along the entire scanning area for correcting unevenness of modulation depth B.

This circuit receives horizontal(H) and vertical(V) of sawtooth and parabola signals and generates dynamic focus (DF) correction signals which are fed to the Process board.

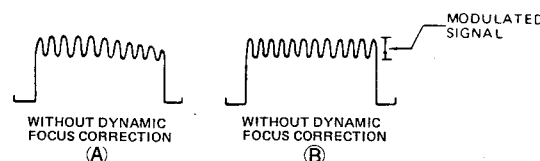


Fig. 7-3 Dynamic Focus Correction

Details

The H parabola signal is fed to VR11 (DF-H PARA) and the H sawtooth signal is fed to VR12 (DF-H SAW). The V parabola signal is fed to VR9 (DF-V PARA) and the V sawtooth signal is fed to VR10 (DF-V SAW). The H sawtooth signal is fed to left side shading correction circuit Q4 and Q3 which generates the left side of dynamic focus signal. VR16 (DF-H LEFT BIAS) controls the left side of dynamic focus bias and VR15 (DF-H LEFT) controls the left side of dynamic focus signal.

These signals are controlled and mixed and supplied to IC4(a) to generate dynamic focus correction signal. The output signal obtained at pin 1 of IC4(a) is supplied to the Process board through terminal 8 of B11.

7-5 Bias Light Shading Correction Circuit

Outline

The light intensity by the bias light LEDs is not uniform along the entire target surface. Therefore, the bias current which is produced by the pick-up is not uniform, but has a shading A.

As described in the section on the principles of single carrier frequency multiplexing, the red and blue signals are obtained by detecting the modulated signals from the preamplifier output using a band pass filter. Therefore, the red and blue signals are free from bias light shading.

However, the luminance signal is obtained by removing the modulated signal using a trap circuit.

Therefore, the luminance signal receives undesirable bias light shading. The bias light shading correction which contains the horizontal sawtooth and parabola signals B to the signal processing circuit to mix it to the pre-amplifier output signal for correcting color shading at low illumination levels C.

This circuit receives horizontal(H) of sawtooth and parabola signals and generates H bias light shading correction signals which are supplied to H bias light shading correction circuit in Process board.

Details

The H parabola signal is fed to VR14 (Bs-H PARA) and the H sawtooth signal is fed to VR13 (Bs-H SAW). These signals are controlled and mixed and supplied to IC4(b) to generate H bias light shading correction signal. The output signal obtained at pin 7 of IC4(b) is supplied to the Process board through terminal 9 of B11.

8 Sync-1 Board

The Sync-1 Board contains following circuits.

8-1	+5V DC Regulator Circuit	65
8-2	EXT/INT 17MHz Oscillator Circuit	66
8-3	Sync Generator Circuit	67
8-4	Sync Separation Circuit	68
8-5	Burst Gate Circuit	68
8-6	SC Phase Shifter Circuit	69
8-7	HD Comparator Circuit	69

8-1 +5V DC Regulator Circuit

Outline

+5V DC is generated by regulating +7.6V DC generated in the +7.6V regulator circuit on the Deflection board. This +5V DC is used as sub-power supply for this board.

Details

The +5V DC voltage is generated by regulating +7.6V DC power using IC8(b) and Q9.

The output voltage of Q9 is applied to pin 6 of IC8(b) to form a feedback loop, and this stabilizing the output voltage. The reference voltage for pin 5 of IC8(b) is obtained by dividing the +7.6V using R40 and R41.

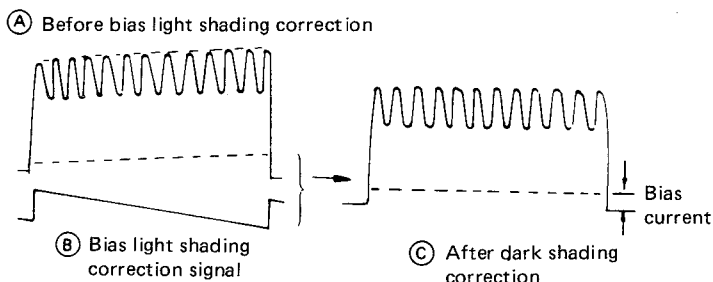


Fig. 7-4 Bias Light Shading Correction

8-2 EXT/INT 17MHz Oscillator Circuit

Outline

This circuit oscillates the 17MHz frequency in the internal sync mode or external sync mode and sends it to the sync generator IC18.

In the gen-lock/external sync mode, the external 17MHz oscillator circuit oscillates the 17MHz to make the subcarrier(SC) signal whose frequency/phase is same as the burst signal of gen-lock signal and the internal 17MHz oscillator circuit stop oscillating.

Details

o EXT 17MHz Oscillator Circuit

In the gen-lock/external sync mode, the SC signal generated in sync generator IC18 and the burst signal separated from the gen-lock signal and sent to SC phase shifter circuit are compared in phase. The phase difference in comparison is converted into the DC voltage and it is sent to 17MHz voltage controlled crystal oscillator (VCXO) consisting of crystal oscillator X2, D3, C42 and CT2 (COLOR LOCK) to control the oscillating frequency by changing the capacitance of variable capacitance diode D3.

The 17MHz frequency is fed back to pin 2 of IC18 to generate the SC signal. In this way, the phase lock loop (PLL) circuit is made and the frequency of VCXO is controlled in order to generate the SC signal whose frequency and relative phase matches that of gen-lock burst signal.

CT2 (COLOR LOCK) is a control for adjusting the lock range of the PLL circuit.

o INT 17MHz Oscillator Circuit

When no signal is supplied to pin 9 of IC14, internal 17MHz oscillator consisting of crystal oscillator X1, CT1 (4.43MHz ADJ) and C41 oscillates 17MHz frequency. The oscillated 17MHz signal is sent to sync generator IC18.

The voltage controlled oscillator (VCO) composed of VL7, C47, C50, D4 and D5 is connected to pin 9 and pin 10 of IC18 and phase-compared with the frequency oscillated by the crystal oscillator.

The phase detected output from pin 8 of IC18 is sent to variable capacitance diodes D4 and D5 through R87 to drive them and control the VCO frequency. This phase lock loop (PLL) circuit always keeps interleaving relationship among subcarrier, horizontal and vertical frequency generated by IC18.

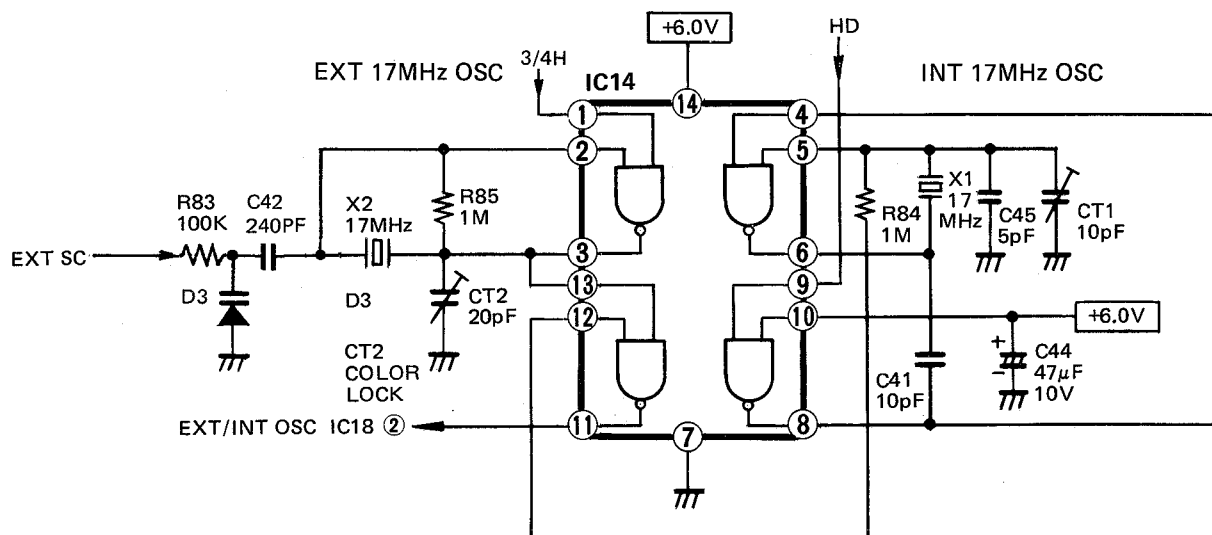


Fig. 8-2 EXT/INT 17MHz Oscillator Circuit

8-3 Sync Generator Circuit

Outline

This circuit receives the 17MHz signal in internal sync mode or external sync mode and generates all sync signals used in the camera.

Details

The following pulses are generated from IC18.

Pin 4 : (B-Y)SC	(Subcarrier for B-Y modulation)
Pin 6 : (R-Y)SC	(Subcarrier for R-Y modulation)
Pin 13 : LSW	(LINE SWITCH)
Pin 15 : W.BL	(Wide blanking pulse)
Pin 16 : BFP	(Burst flag pulse)
Pin 17 : SYNC	(Composite sync pulse)
Pin 18 : BL	(Composite blanking pulse)
Pin 19 : Vs	(Vertical scanning start pulse)
Pin 20 : PRE BL	(Preblanking pulse)
Pin 21 : CP1	(Clamp pulse-1)
Pin 22 : Hs	(Horizontal scanning start pulse)

The timing information for each pulse is shown in Fig. 8-3-1.

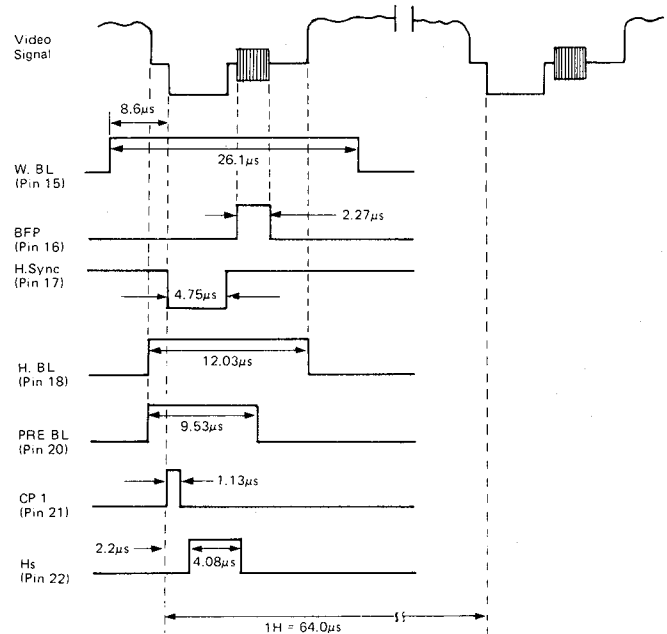


Fig. 8-3-1 Pulses

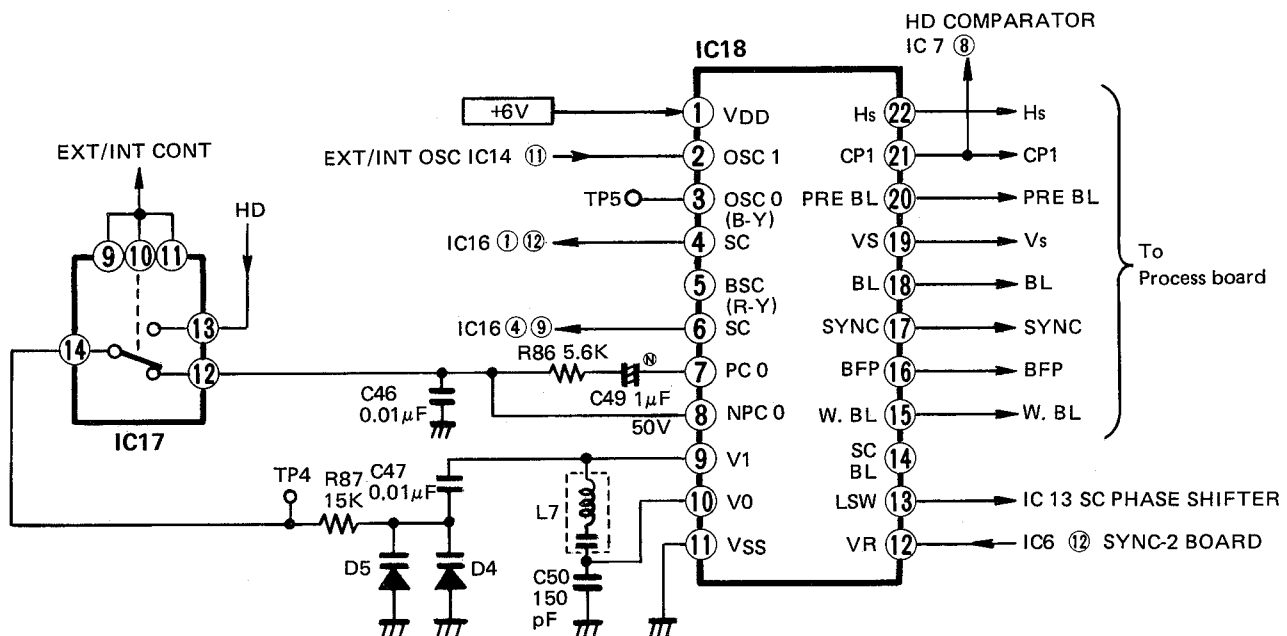


Fig. 8-3-2 Sync Generator Circuit

8-4 Sync Separation Circuit

Outline

This circuit receives the black burst signal or color signal supplied to the gen-lock input connector on the rear of camera, and separate the sync signal from the gen-lock signal. The separated sync signal is fed to the pulse generator circuit for the gen-lock/external sync mode.

Details

The gen-lock signal (the black burst or color signal) is sent through pin 2 of CN1 to base of Q1.

The base of sync separation Q5 receives gen-lock signal through amplifier Q1, Q2 and Q4 from pin 2 of CN1. The separated sync signal obtained at collector of Q5 is sent to the field detector circuit and the pulse generator circuit.

8-5 Burst Gate Circuit

Outline

This circuit receives the black burst signal or color signal supplied to the gen-lock input connector on the rear of camera, and separate the burst signal from the gen-lock signal. The separated burst signal is fed to SC phase shifter circuit and the field detector circuit on Sync-2 board for the gen-lock/external sync mode.

Details

The gen-lock signal is sent to burst gate consisting of Q901 inside IC9 and Q1005 inside IC10.

The positive burst flag pulse is sent to base of Q1005 inside IC10 from pulse generator on Sync-2 board. The Q1005 turns OFF during negative portion of burst flag pulse and Q1005 turns ON during positive portion of burst flag pulse. As a result, burst signal is detected. The detected signal is sent through Q10, Q11 to field detector circuit on Sync-2 board and sent through C32 to SC phase shifter circuit.

The DC voltage set by Q902, Q903 and Q904 inside IC9 determines cut off level of the BL period and the DC voltage set by Q1001, Q1002, Q1003 and Q1004 inside IC10 determines cut off level of the burst flag pulse period.

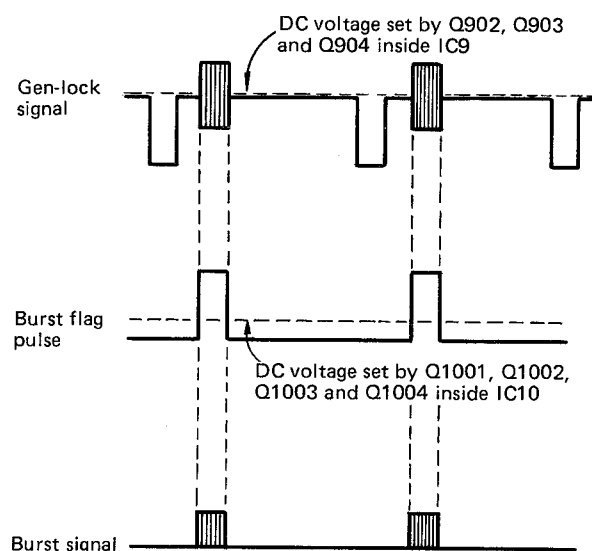


Fig. 8-5-1 Burst Gate Signal.

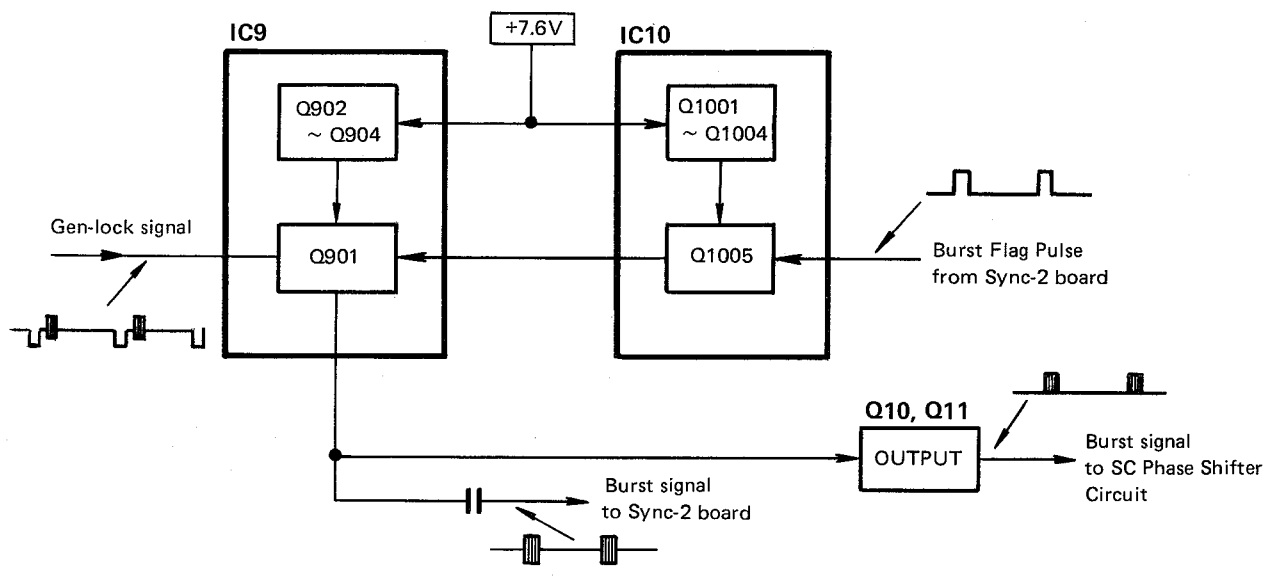


Fig. 8-5-2 Burst Gate Circuit

8-6 SC Phase Shifter Circuit

Outline

In this system using multiple cameras, the burst signal on each camera video signal should be adjusted to same phase. This circuit shifts the phase of subcarrier(SC) signal generated in the sync generator IC18 to adjust the phase of burst signal.

Details

SC(B-Y) signal is supplied from sync generator IC18 to SC phase shifter IC15 through inverter IC16.

SC(R-Y) signal is supplied from sync generator IC18 to SC phase shifter IC15 through inverter IC16.

The shifted SC(B-Y) signal and SC(R-Y) signal are supplied to SC comparator pins 9 and 13 of IC12 and compared in Q1201, Q1202, Q1203 and Q1204 inside IC12 and sent to IC11.

The gen-lock burst signal is supplied from burst gate circuit to pin 6 of SC comparator IC11 through SC phase fine shifter Q12.

The compared SC(B-Y), SC(R-Y) and gen-lock burst signal are compared in Q1101, Q1102, Q1103 and Q1104 inside IC11 and output signals are sent to IC13 through Q14 and Q15. The SC phase difference in phase is converted into the DC voltage and DC voltage is obtained of pin 5 of IC13 and it is sent to the EXT 17MHz OSC circuit through low pass filter R80, C39 and SC output Q16.

SW1 and SW2 (SC PHASE COARSE SWITCH) shift the phase of subcarrier signal from 0° to 360° in 90° step and VR4 (SC PHASE FINE) shifts the phase of subcarrier signal from 0° to 90° .

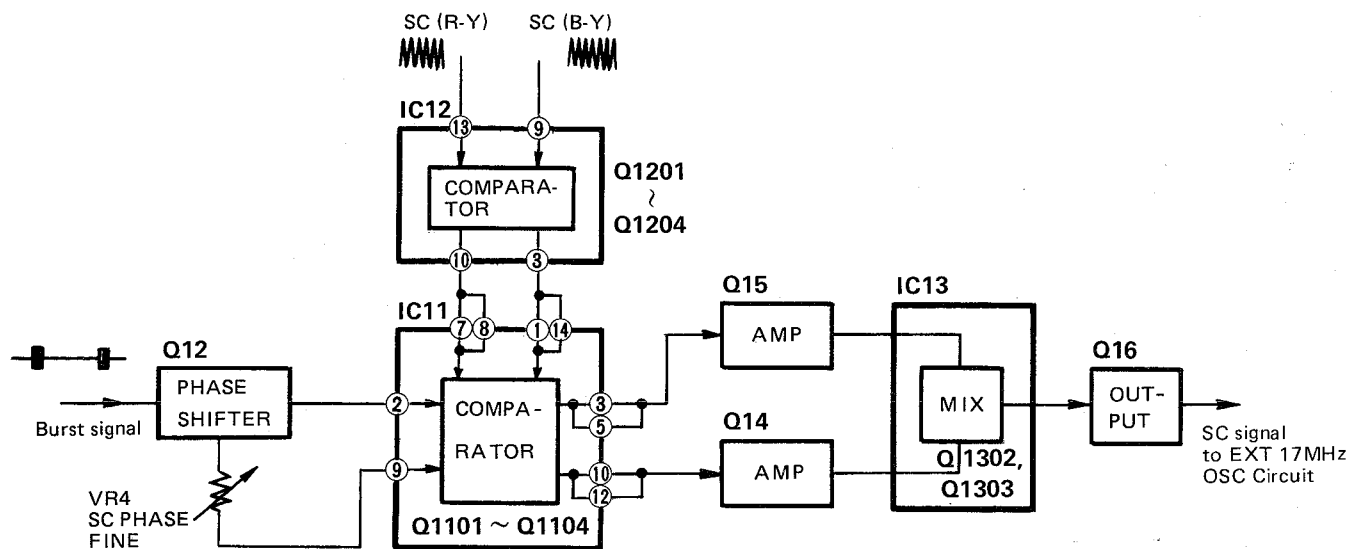


Fig. 8-6 SC Phase Shifter Circuit

8-7 HD Comparator Circuit

Outline

This circuit compares HD pulse and CP2 pulse and output is sent to sync generator and the sync generator is oscillated voltage controlled oscillator (VCO).

Details

The HD pulse is sent from HD pulse generator circuit on Sync-2 board to pin 7 of comparator IC7 and the CP2 pulse is sent from sync generator IC18 to pin 8 of comparator IC7 and they are compared inside IC7. The compares pulse is sent to VCO circuit through amplifier IC8 and INT/EXT select switch IC17.

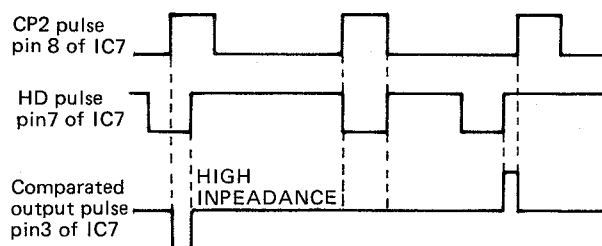


Fig. 8-7-1 HD Comparator Signal

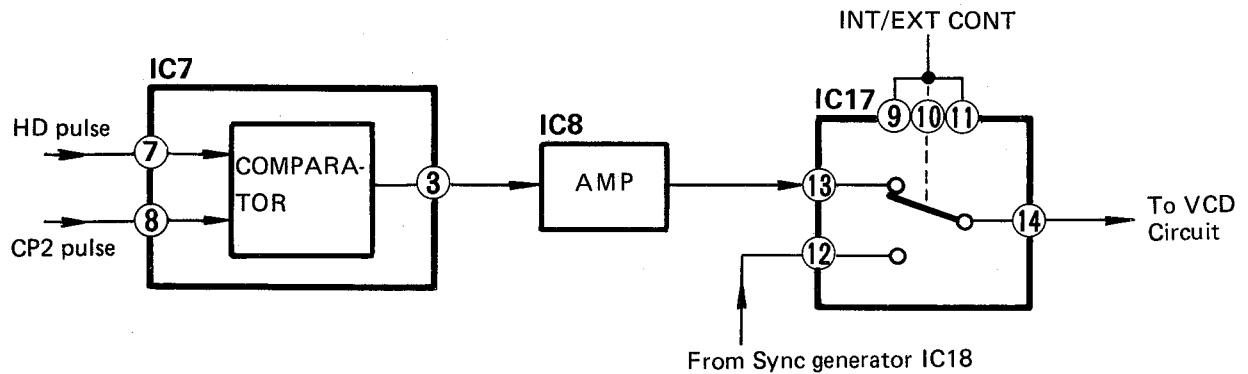


Fig. 8-7-2 HD Comparator Circuit

9 Sync-2 Board

9-1 Field Detector Circuit

Outline

This circuit receives gen-lock sync signal from sync separator, burst pulse from burst gate and third field pulse from pulse generator circuit, and then generates fourth field pulse.

Details

When the gen-lock signal is supplied to GEN-LOCK connector, sync signal from sync separation circuit on Sync-1 board is supplied to vertical sync separator Q6, Q7 and Q8 and horizontal sync is removed.

The V sync is fed to pin 13 of monostable multivibrator IC5 through NAND gate IC1(a).

The burst pulse signal from burst gate circuit on Sync-1 board and third field pulse from pulse generator circuit are supplied to NAND gate IC1(b) and then sent to pin 10 of monostable multivibrator IC5. The fourth field pulse generated in monostable multivibrator IC5 is fed to V reset pulse generator in pulse generator circuit. The V sync is also fed to third field pulse generator IC2 in pulse generator circuit through NAND gate IC1(b).

9-2 Pulse Generator Circuit

Outline

This circuit receives gen-lock sync signal from sync separator, V sync signal and fourth field pulse from field detector circuit and then generates V reset pulse, third field pulse, HD pulse and burst flag pulse.

Details

The V reset pulse is used to trigger the sync generator IC18 to generate pulse phase locked to gen-lock signal. The fourth field pulse is supplied to pin 2 of monostable multivibrator IC6(a) and generated pulse is fed to pin 10 of monostable multivibrator IC6(b) and V reset pulse is obtained at pin 12 of IC6.

The V reset pulse is fed to pin 12 of sync generator IC18.

VR3 (V RESET PULSE PHASE) controls vertical reset pulse phase.

The gen-lock sync signal from sync separation circuit on Sync-1 board is supplied to pin 2 of monostable multivibrator IC3(a) and generated pulse (3/4H pulse) is fed to pin 10 of monostable multivibrator IC3(b) and HD pulse is obtained.

The 3/4H pulse is also sent to INT/EXT select IC17. It selects internal mode or external mode and 3/4H pulse is sent to pin 2 of monostable multivibrator IC4(a) and generated pulse is sent to pin 10 of monostable multivibrator IC4(b) and burst flag pulse is obtained. The burst flag pulse is sent to burst gate circuit.

The V sync pulse from V sync separation circuit is supplied to pin 10 of monostable multivibrator IC2(a) and generated pulse is supplied to pin 2 of monostable multivibrator IC2(b) and third field pulse is obtained. The third field pulse is sent to field detector circuit. VR1 (3FP SET) is for setting third field pulse.

10 Electronic Viewfinder Board

10-1 Video Amplifier Circuit

Outline

This circuit amplifies the video signal supplied from the Deflection board and fed it to the cathode ray tube (CRT).

Details

The video signal mixed with level indicator signal and character signal from the Deflection board is supplied to amplifier Q2 through pin No. 6 of EVF connector CN102, terminal No. 8 of CN1 and VR3 (CONTRAST). The amplified video signal at the collector of Q2 is then supplied to grid-1(G1) of the CRT through terminal No. 6 of B11 and CRT socket CN104 together with DC voltage set by VR2 (BRIGHTNESS).

10-2 Horizontal Deflection Circuit

Outline

This circuit generates the horizontal(H) deflection sawtooth current for H.scanning beam inside the cathode ray tube (CRT).

Details

The frequency controlled horizontal drive (H.D.) pulse from the Deflection board is supplied to the base of switching amplifier Q1 through pin No. 1 of EVF connector CN102 and terminal No. 3 of CN1.

The horizontal(H) deflection sawtooth current obtained at the collector of Q1 is supplied to the H.deflection coil through C9, L2, VL3 (H.SIZE) and terminal No. 2 of CN2.

The flyback pulse obtained at the collector of Q1 is also fed to the high voltage circuit.

10-3 High Voltage Circuit

Outline

This circuit generates high voltages for cathode ray tube (CRT) electrodes.

Details

The flyback pulse generated in the horizontal(H) deflection circuit is supplied to primary winding of the flyback transformer (FBT) in high voltage pack T1 to step up the flyback pulse to necessary level. The boosted pulses obtained at the secondary winding of the transformer are rectified to generate high voltages.

+4.5KV obtained by rectifying the boosted pulse is supplied to the CRT anode.

+600V obtained by rectifying the boosted pulse is supplied to grid-3(G3) of the CRT through VR1 (FOCUS). The voltage of grid-2(G2) is derived by dividing +600V by VR1, R1 and R2.

The voltage of grid-1(G1) is derived by rectifying the negative pulse from the FBT. Then the rectified -55V is supplied to G1 through VR2 (BRIGHTNESS) together with the video signal supplied from the video amplifier circuit.

The heater voltage for CRT is supplied +4.8V and +7.6V from the Deflection board through EVF connector CN102 and CN1.

11 Camera Remote Control Unit (Option) : WV-CR10E/N

Outline

This camera remote control unit, WV-CR10E/N is used to control the camera operations remotely with the detached EVF unit for power Zoom, Fade and VTR Start/Stop Switch(REC).

The remote operation function of power focus (Focus FAR/REAR) and auto focus Auto/Man selection (AUOT FOCUS LENS AUTO/MAN) are not functioned when PEMOTE CONTROL UNIT WV-CR10 is used with WVP-G1.

Details

11-1 Power Zoom

The switch for WIDE and TELE is the seesaw type switch so that only either switch is ON or OFF. The WIDE switch, SW6 is connected with the base of Q2 on Audio/Lens Control board through camera remote connector CN105.

The TELE switch, SW7 is connected with the base of Q4 on Audio/Lens Control board through camera remote connector CN105.

When the WIDE switch, SW6 is closed, the base of Q2 becomes LOW and Q2 is turned ON. The base of Q4 is HIGH so that Q004 is OFF. The base of Q3 also becomes LOW so that Q3 is turned ON and drives the power zoom motor for WIDE.

When the TELE switch, SW7 is closed, the base of Q4 on Audio/Lens Control board becomes LOW and Q4 is turned ON. The base of Q2 is HIGH so that Q2 is OFF.

The base of Q1 also becomes LOW so that Q1 is turned ON and drives the power zoom motor for TELE.

The power zoom switch on the adjustable handle grip has priority.

When the WIDE switch on the camera is pressed during the TELE switch, SW7 on the camera remote control unit is closed, the base of Q005 on the camera remote control unit becomes LOW so that Q005 is OFF and the WIDE switch on the grip is activated.

When the TELE switch on the grip is pressed during the WIDE switch, SW6 on the camera remote control unit is closed, the base of the Q004 on the camera remote control unit becomes LOW so that Q004 is OFF and the TELE switch on the grip is activated.

11-4 FADE and REC Switch

When the FADE switch SW5 is pressed, +4.8V DC is supplied to pin 5 of camera remote connector CN105. This +4.8V DC is supplied to process board through Audio/Lens Control board and the camera is ready for FADE-IN or FADE-OUT.

When the REC switch SW4 is pressed, the low level is supplied to the pin 5 of CN105. This low level is supplied to the process board through Audio/Lens Control board and the camera becomes the REC-PLAY or REC-PLAY-PAUSE mode.

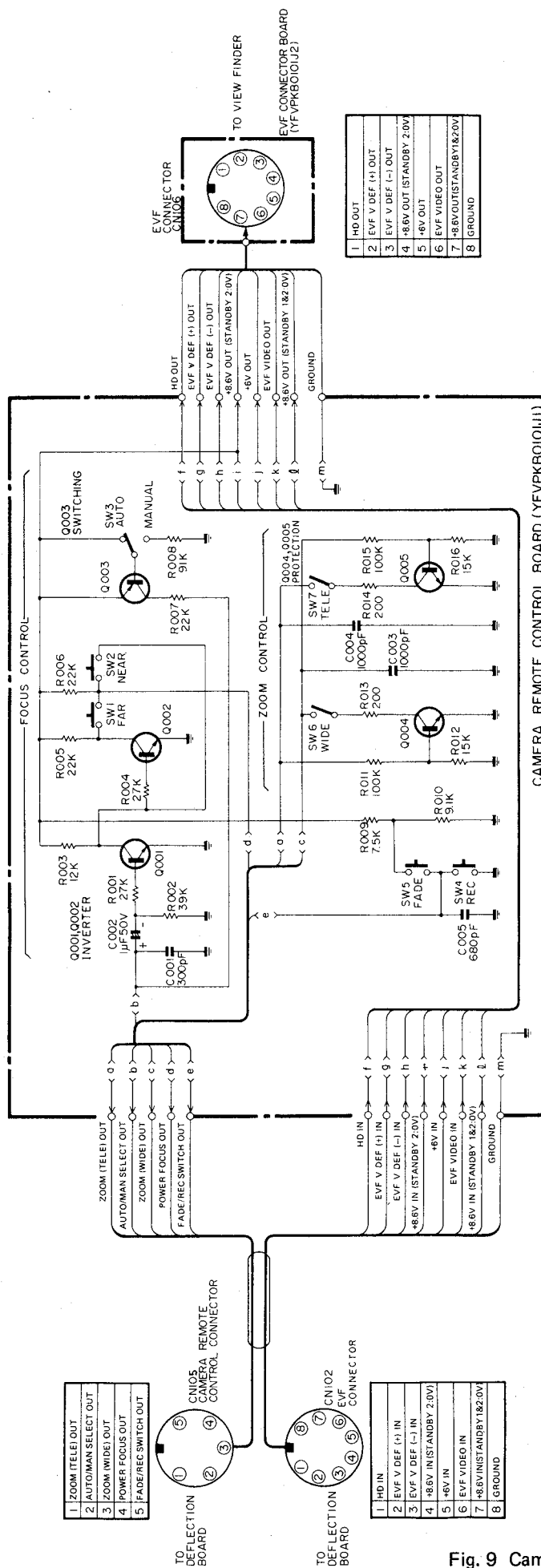


Fig. 9 Camera Remote Control Unit

Service Manual

Vol. 2

Adjustment Procedures
Troubleshooting Guides

Colour Video Cameras

WVP-G1E/WVP-G1N

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Test equipment denoted by shaded outlines are not required if only pick-up tube is replaced.

1. TEST EQUIPMENT REQUIRED

The following equipment is required for adjustment of WVP-G1 colour camera.

- Oscilloscope (dual trace, delayed, 25MHz bandwidth, with three probes)
- Digital voltmeter (DVM)
- Signal generator or special effects generator
- Frequency counter
- Vectorscope
- Colour video monitor
- Tripod
- AC adaptor or DC power 12V
- Lighting (140 footcandles (1400 lux), 3200° K)
- Light meter
- Logarithmic gray scale chart (Part No. YWV2310RB99) (Fig. 1-1).

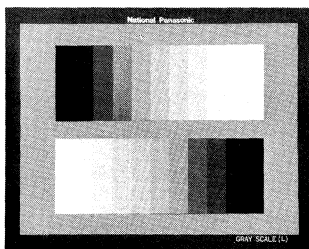


Fig. 1-1

- Colour chart (Part No. YWV2100RB98) (Fig. 1-2)

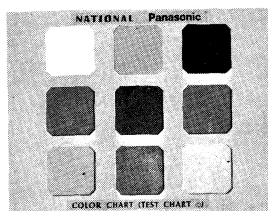
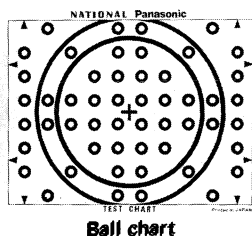
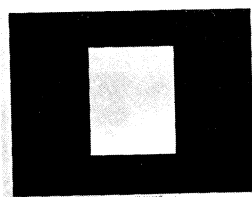


Fig. 1-2

- Ball/White set chart (Part No. YWV2100RB03) (Fig. 1-3)



Ball chart



White set chart

Fig. 1-3

2. DISASSEMBLY PROCEDURE FOR ADJUSTMENT

2-1. Camera Unit

- Turn OFF the power.
- Remove two screws on left side cover holding the left side cover and remove the cover by sliding it backward. (Fig. 2-1-1)

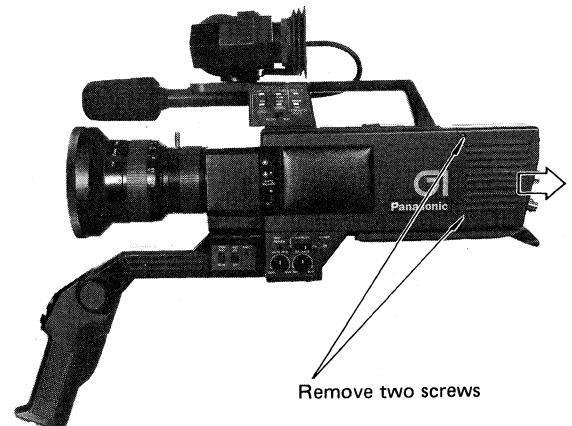


Fig. 2-1-1

- Remove two screws on right holding the right side cover and remove the cover by sliding it backward. (Fig. 2-1-2)



Fig. 2-1-2

- Remove two screws which hold the each of Process board and Deflection board in order to gain access to the desired circuitry.

(A) For right side PCB (Viewed from the front)
Process Board

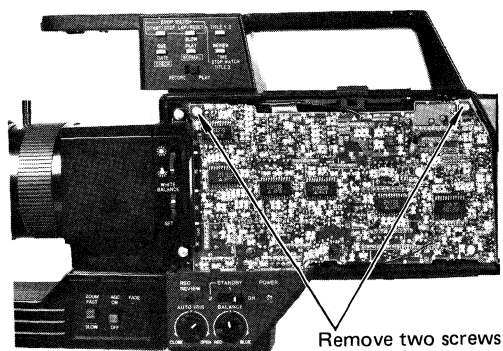


Fig. 2-1-3

(B) For left rear side PCB (Viewed from the front)
Deflection Board

(C) For left front side PCB (Viewed from the front)
Microprocessor Board

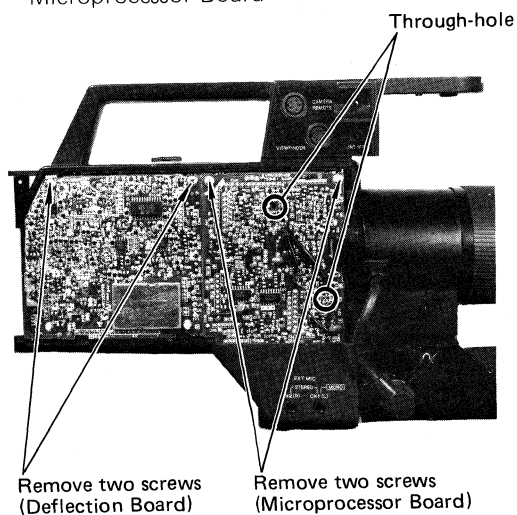


Fig. 2-1-4

Note : Do not remove two screws holding the Microprocessor board unless when adjusting back-focus and replacing the pick-up tube.
(See page 3)
When adjusting Microprocessor board, remove two screws which holding Microprocessor board and disconnect CN1 and CN2.

Caution : The plug (CN2) of Key board (B) becomes poor contact due to shave out the carbon conductor from plastic face plate, when connection and disconnection are repeated several times. In such a case, cut 2 ~ 3 mm of the edge portion of plug for restoration of the contact. (Fig. 2-1-5)

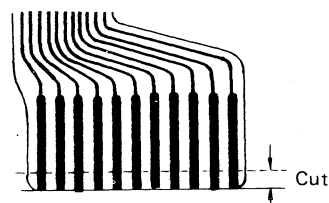


Fig. 2-1-5

Remove four screws which holding the switch board.
(Fig. 2-1-6, 2-1-7)

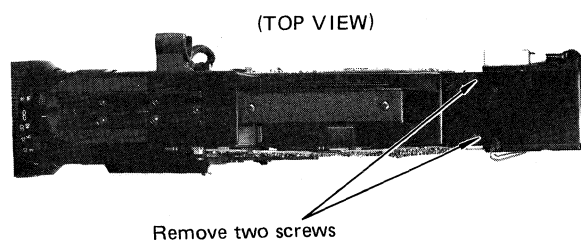


Fig. 2-1-6

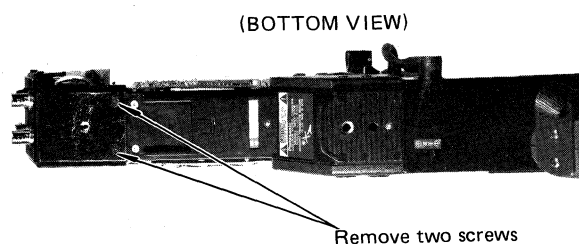


Fig. 2-1-7

- Remove two screws which holding the shield case cover on the Sync-1 board and remove the shield case cover.

2.2 Viewfinder (EVF) Unit

- Disconnect the viewfinder connector.
- Unlock the EVF lock lever. (Fig. 2-2-1)

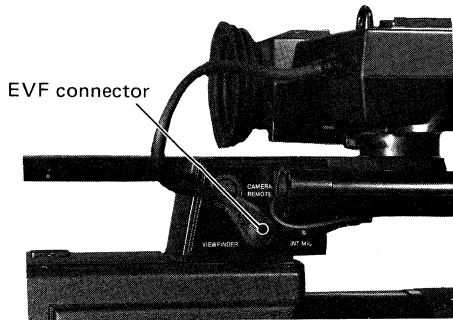


Fig. 2-2-1

- Remove the viewfinder by pulling it forward while pressing EVF release button. (Fig. 2-2-2)

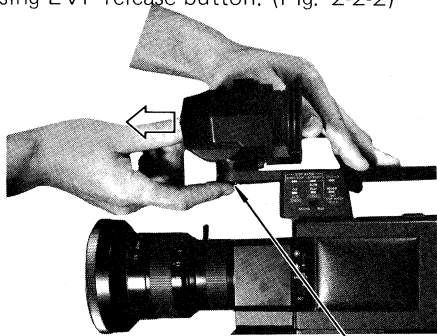


Fig. 2-2-2

- Remove two screws from the bottom and remove bottom cover. (Fig. 2-2-3, Fig. 2-2-4)

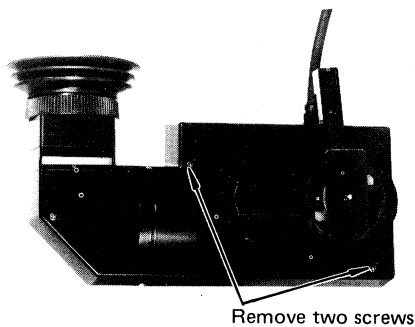


Fig. 2-2-3

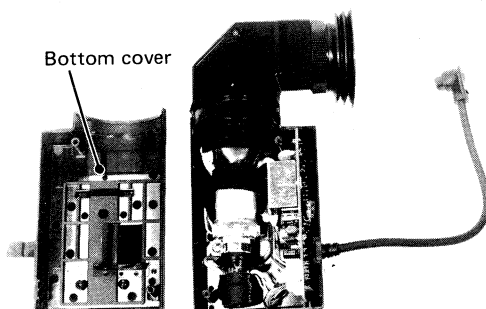


Fig. 2-2-4

3. REPLACEMENT PROCEDURE

3-1 Pick-up Tube Assembly Replacement

- Disassemble the camera as previously described in Section 2 "DISASSEMBLY PROCEDURE FOR ADJUSTMENT" on page 1.
- Remove the EVF and Microphone from the camera. (Refer to 2-2 on page 3 and 3-3 on page 6.)
- Disconnect the CN1 and CN2 on Microprocessor board. (Fig. 3-1-1)

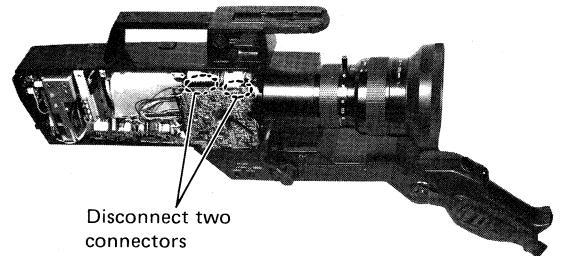


Fig. 3-1-1

- Unsolder the ground wire of the shield cover, remove one screw holding shield cover A and B and remove them. (Fig. 3-1-2)

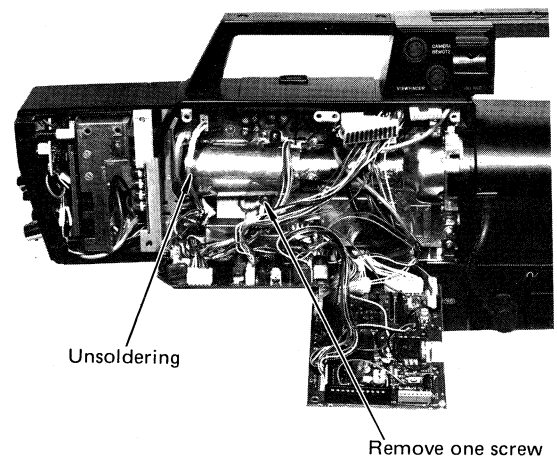
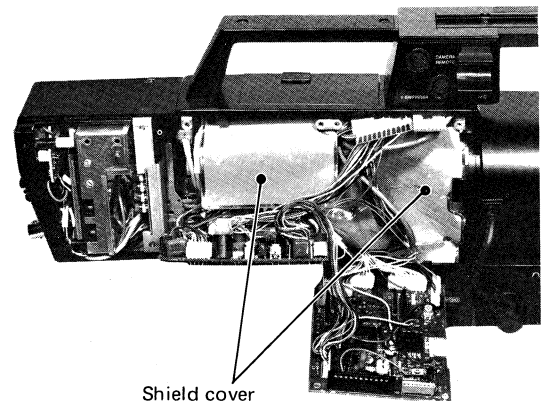


Fig. 3-1-2

- Remove three screws and unsolder one point holding the shield plate of the coil holder and shield plate of the preamplifier board holder and remove these shield plates. (Fig. 3-1-3)
- Remove two screws holding the shield plate and remove the shield plate by pulling it backward, while pulling the other side of shield plate forward. (Fig. 3-1-3)

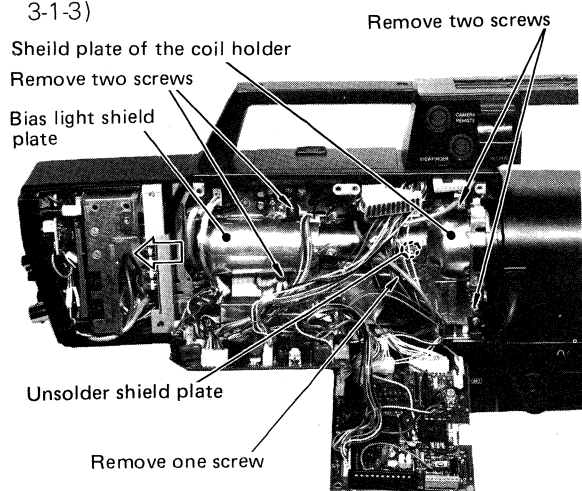


Fig. 3-1-3

- Remove preamplifier shield case by pulling it outward. (Fig. 3-1-4)

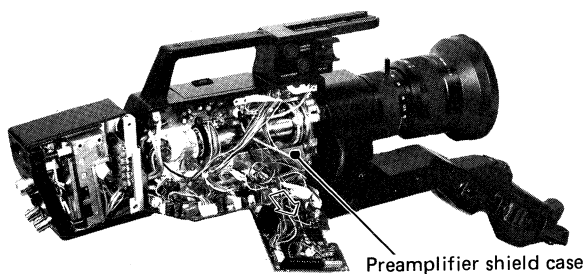


Fig. 3-1-4

- Unsolder the target lead.
- Disconnect pick-up tube socket from the pick-up tube.
- Remove two screws holding pick-up tube holder.
- Remove the backfocus adjusting ring from the coil holder by turning it counterclockwise (Viewed from the rear) (Fig. 3-1-5)

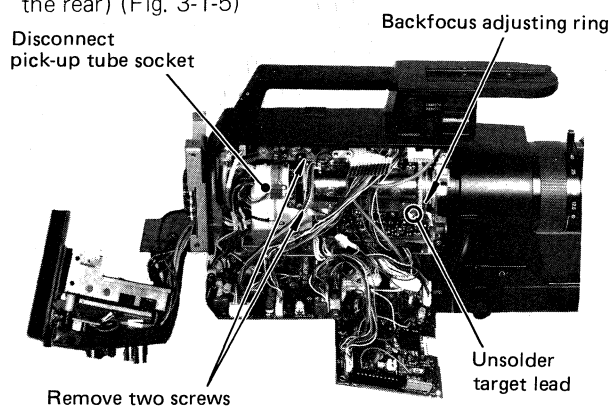


Fig. 3-1-5

- Remove the pick-up tube and deflection coil assembly by pulling it backward. (Fig. 3-1-6)

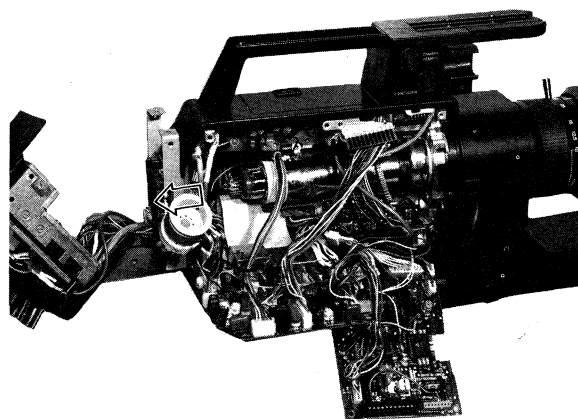


Fig. 3-1-6

- Take out the backfocus adjusting ring and pick-up tube holder from the pick-up tube and deflection coil assembly. (Fig. 3-1-7)

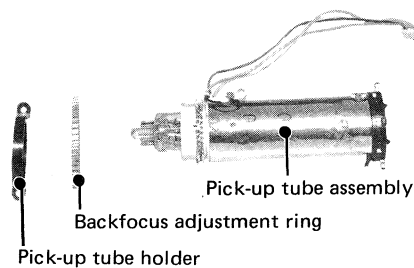


Fig. 3-1-7

Remove one screw holding the pick-up tube and remove the pick-up tube by pulling it forward. (Fig. 3-1-8)

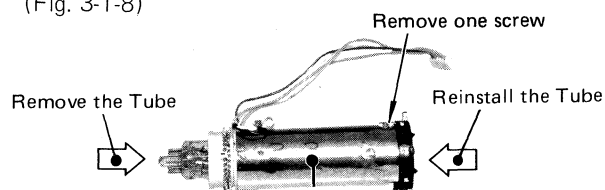


Fig. 3-1-8

Clean the faceplate of the new pick-up tube with the lens cleaning tissue or cloth.

Reinstall the new pick-up tube to deflection coil. (Fig. 3-1-8)

- Reinstall the backfocus adjusting ring and pick-up tube holder to pick-up tube assembly. (See Fig. 3-1-7 on page 4)
- Reinstall the pick-up tube assembly into the chassis. (Fig. 3-1-9)

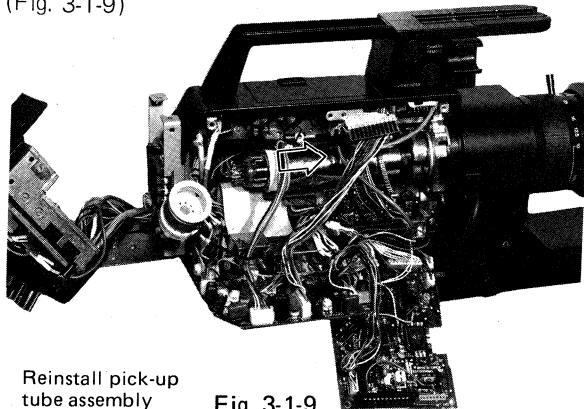


Fig. 3-1-9

- Note : 1. The target lead has to be positioned downward.
2. Make sure that the protruding part of the deflection coil engages the recessed part of the coil holder. (Fig. 3-1-10)

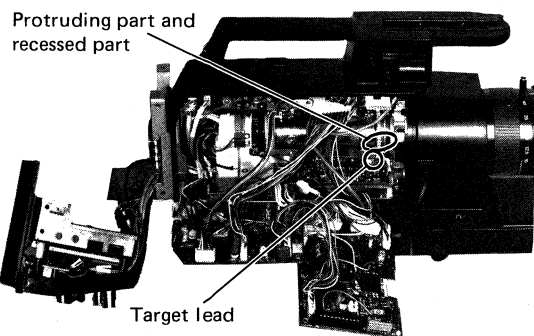


Fig. 3-1-10

- Reinstall the pick-up tube holder by fixing two screws and connect the pick-up tube socket.
- Reinstall the backfocus adjusting ring to the coil holder by turning it clockwise (Viewed from rear).
- Solder the target lead. (Fig. 3-1-11)

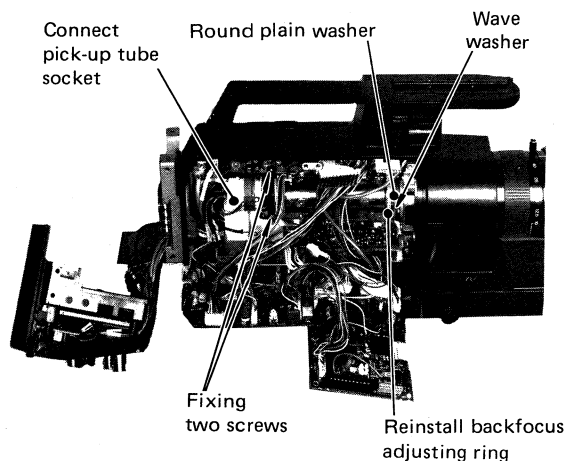


Fig. 3-1-11

Note : Make sure that the wave washer and round plain washer are placed into prescribed position.

After replacing the pick-up tube, adjust the camera while referring to Section 4. ADJUSTMENT PROCEDURE on page 9.

3-2 Display key Board Replacement

- Disassemble the camera as previously described in Section 2 "DISASSEMBLY PROCEDURE FOR ADJUSTMENT" on page 1.
- Remove the Microphone and EVF from camera. (Refer to 2-2 on page 3 and 3-3 on page 6)
- Remove two screws holding the handle cover and three screws holding EVF mounting on the upper cover. And remove the handle cover by pulling it upward and EVF mounting. (Fig. 3-2-1)

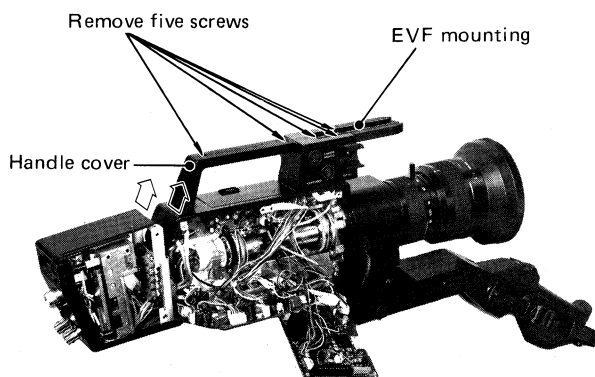


Fig. 3-2-1

- Remove one screw holding the microphone mounting base and one screw holding upper cover. (Fig. 3-2-2)

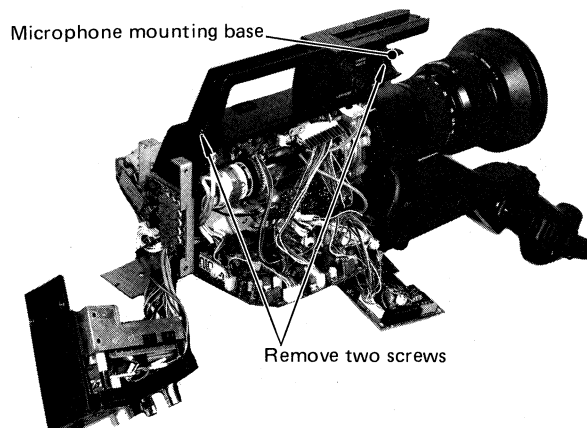


Fig. 3-2-2

- Lift the rear side of upper cover.
- Remove the key board (A) by pressing the key board locking tabs on the bottom inside of the key board to upward.
- Remove the Microphone connector and EVF board by the same procedure. (Fig. 3-2-3, Fig. 3-2-4)

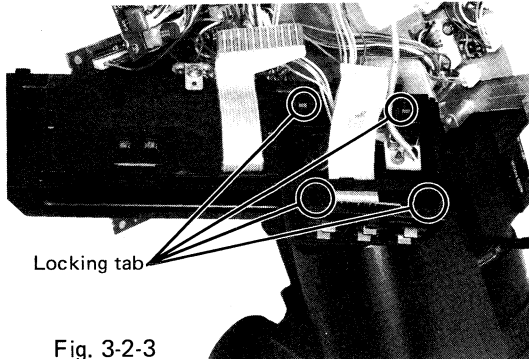


Fig. 3-2-3

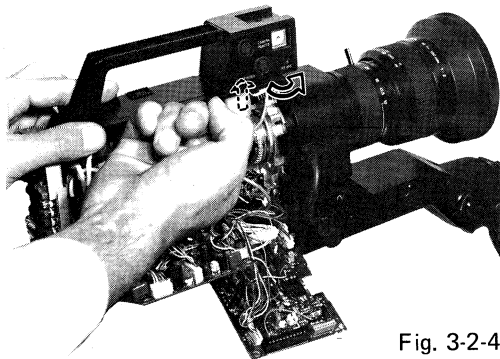


Fig. 3-2-4

- Remove the upper cover by pulling it upward.
- Remove the key board (B) locking pin. (Fig. 3-2-5)

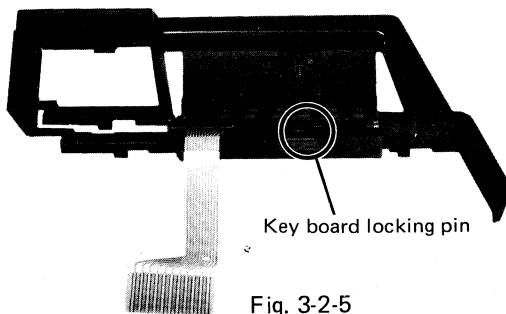


Fig. 3-2-5

- Remove the key board (B) by pulling it outward while keeping it slant. (Fig. 3-2-6)

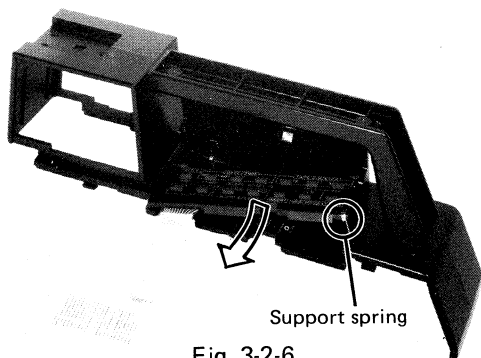


Fig. 3-2-6

Note : When replacing the key board (B), make sure that the support spring is installed in prescribed position.

3-3 Microphone Unit Replacement

- Disconnect the microphone connector.
- Remove the microphone by pulling it forward. (Fig. 3-3-1)

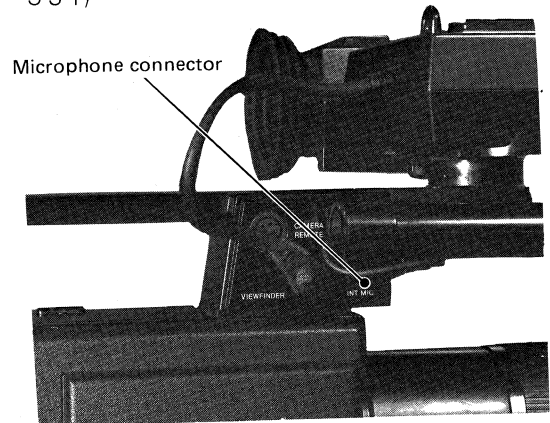


Fig. 3-3-1

3-4 CRT Replacement

- Disassemble the EVF as previously described in Section 2 "DISASSEMBLY PROCEDURE FOR ADJUSTMENT" on page 1.
- Remove one screw on upper side of CRT case and remove the case. (Fig. 3-4-1, Fig. 3-4-2)

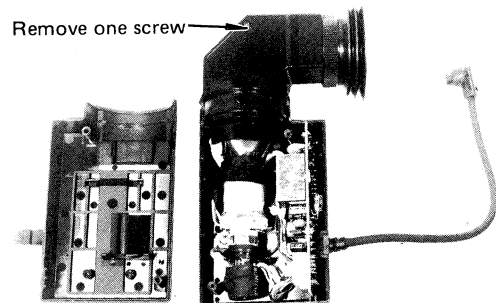


Fig. 3-4-1

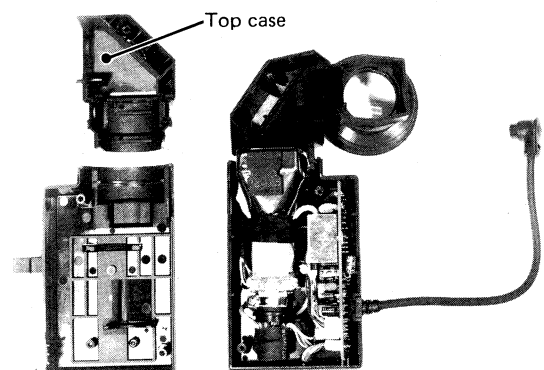


Fig. 3-4-2

- After replacing the parts, reinstall the EVF in reverse order of disassembly procedure.

Note : 1. When reinstalling the bottom cover, make sure that the plate spring is attached on the upper cover. (Fig. 3-4-3)

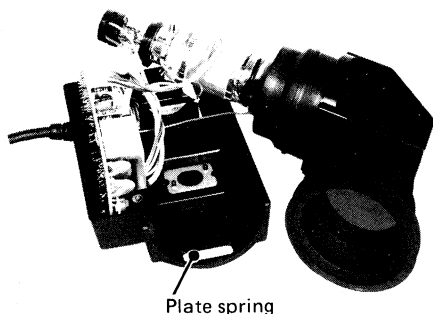


Fig. 3-4-3

Note : 2. When replacing CRT and case assembly, make sure that the CRT socket assembly and printed circuit board are in the groove portion of the bottom cover. (Fig. 3-4-4)

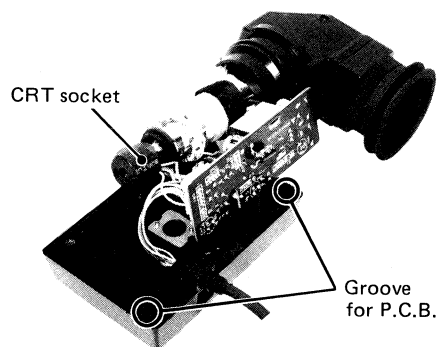


Fig. 3-4-4

3-5 Lens Replacement

- Disconnect the lens connector.
- Remove the lens hood by turning it counterclockwise.
- While depressing the lens release button backward, remove the lens by turning clockwise (approximately 60°). (Fig. 3-5-1)

Depressing the lens release button backward

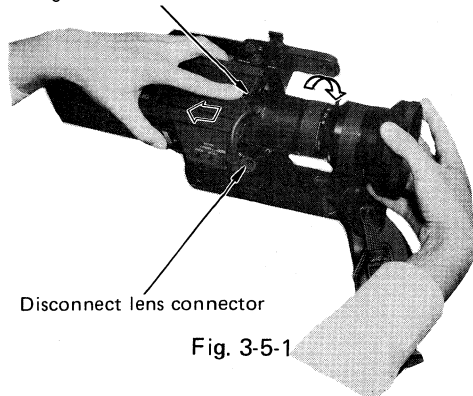


Fig. 3-5-1

- Remove three screws which hold the iris back cover and remove the iris back cover. (Fig. 3-5-2)

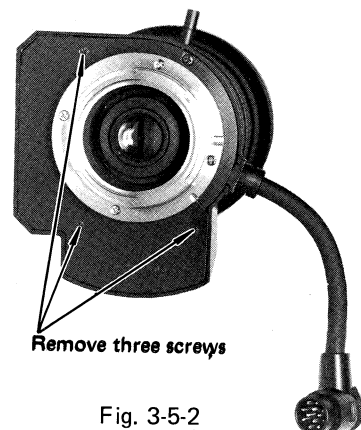


Fig. 3-5-2

- Remove three screws which hold lens mounting assembly and remove the lens mounting assembly. (Fig. 3-5-3)

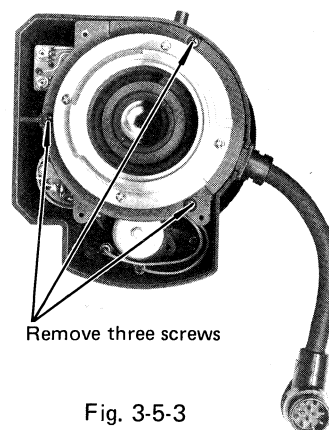


Fig. 3-5-3

- Unsolder the eight wires at zoom motor and iris assembly and remove the lens connector cable assembly. (Fig. 3-5-4)

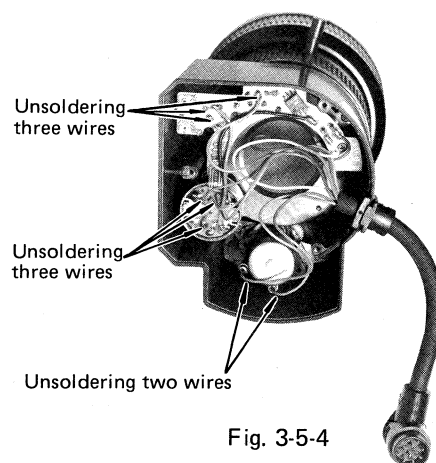


Fig. 3-5-4

- Remove three screws which hold the ALC assembly and remove the ALC assembly. (Fig. 3-5-5)

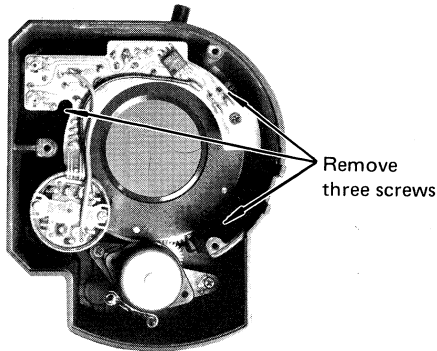


Fig. 3-5-5

- Remove three screws which hold iris cover and remove iris cover. (Fig. 3-5-7)

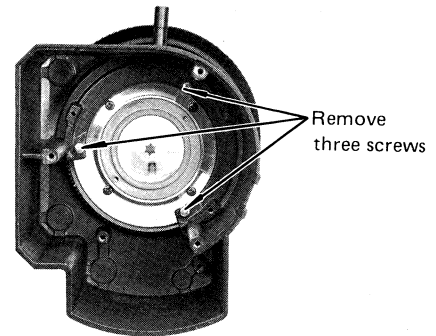


Fig. 3-5-7

- Remove two screws which hold the zoom motor assembly and remove the zoom motor assembly. (Fig. 3-5-6)

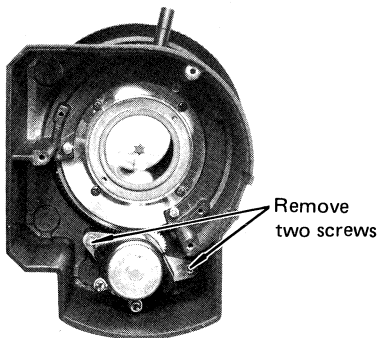


Fig. 3-5-6

- After replacing the parts, reinstall the lens in reverse order of disassembly procedure.

Note : 1. When replacing the lens, clean the lens with lens cleaning tissue.
2. When replacing the lens assembly, refer to Fig. 3-5-8 for wiring.

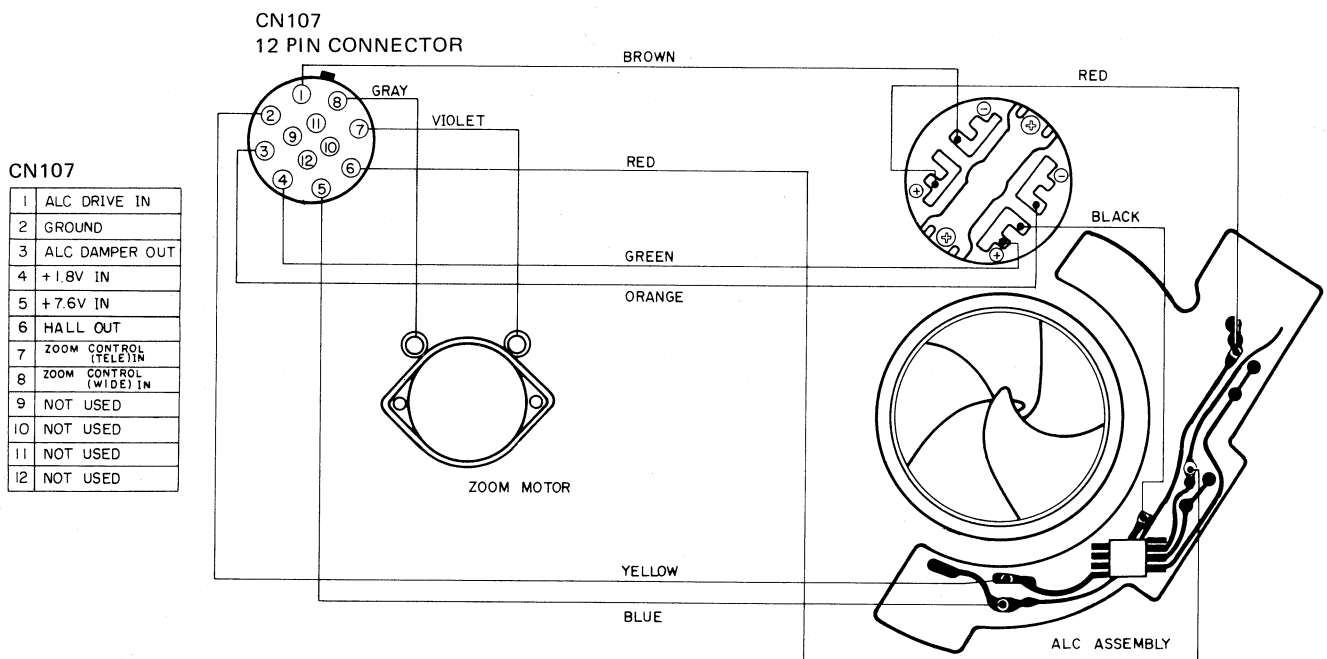


Fig. 3-5-8

4. ADJUSTMENT PROCEDURE

4-1 Connection and Setting Up for Adjustment

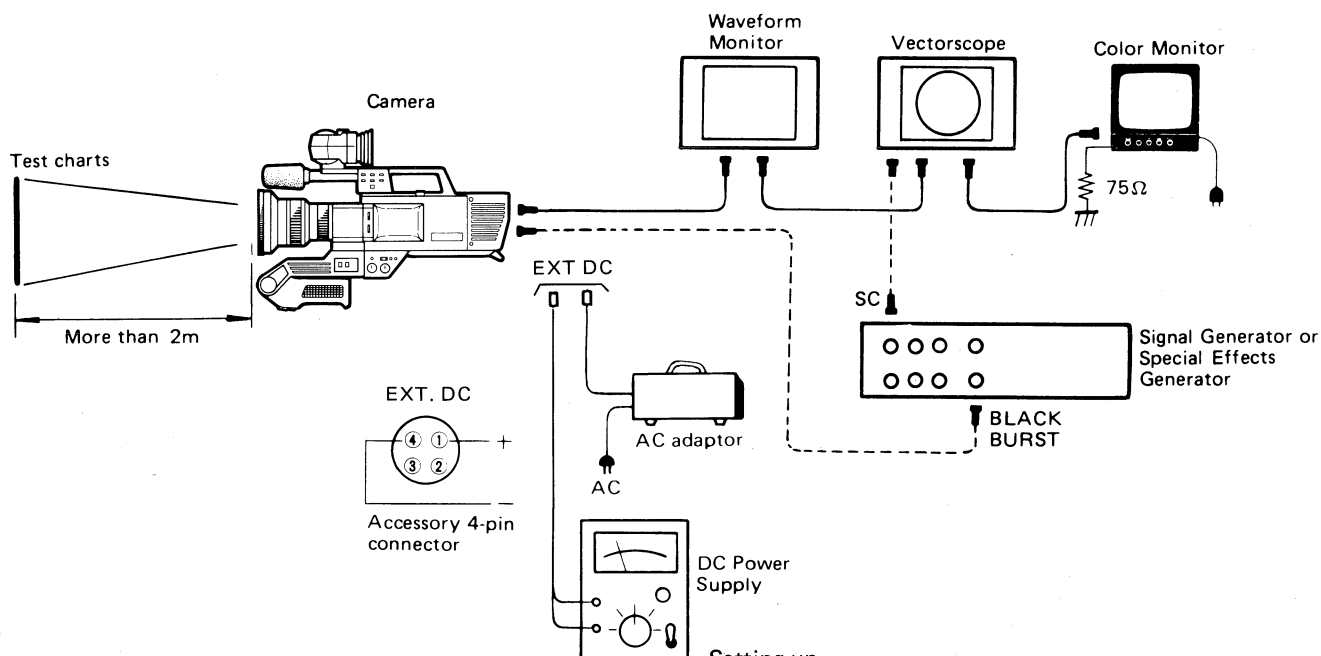


Fig. 4-1-1

Setting up

- Light : Incident light intensity on chart : 140 footcandles (1400 lux)
Colour temperature : 3200 K
- Turn ON the colour camera for at least 30 minutes prior to adjustment.
- Distance between the camera and test chart should be more than 2m.
- Test Charts : Logarithmic gray scale chart (YWV2310RB99)
Colour chart (YWV2100RB98)
Flat white chart
Ball/white set chart (Window chart) (YWV2100RB03)

Connection

- Connect the VIDEO OUT connector on the rear of camera to the VIDEO IN connector of color video monitor through the vectorscope using coaxial cables.
- Terminate the video input of color video monitor with 75 ohms.
- Connect the BLACK BURST OUT of special effects generator or signal generator to the GEN-LOCK connector on the rear of camera using a coaxial cable when instructed.
- Connect the SC (subcarrier) OUT of special effects generator or signal generator to the external sub-carrier reference (EXT CWφREF) connector of vectorscope using a coaxial cable when instructed.
- Supply 12V DC to the EXT DC connector of camera from the AC adaptor/battery recharger NV-B51, NV-B51E or equivalent.
(When NV-B51 or NV-B51E is used, the optional junction cable 4C-10 is required.)

Disassembling

- Disassemble the camera while referring to Section 2. DISASSEMBLY PROCEDURE FOR ADJUSTMENT on page 1.

Position of controls and switches on the camera

Set the controls and switches on the camera as follows;

Indoor/Outdoor switch	Lower (INDOOR) position
White balance switch	Upper (WHITE BALANCE) position
Standby (Power) switch	Right (ON) position
Auto Iris control	Centre (click) position
Colour balance control	Centre (click) position
AGC ON/OFF switch	OFF position
YL ON/OFF switch (SW1 on process board)	ON position
Power Select switch	EXT DC position

Note : TP in the manual refers to a test point on the printed circuit board.

4-2 Camera Unit Adjustment

Refer to page 27, 28 and 29 for the test points and adjusting controls.

Caution : 1. Do not set the white balance (AWC) during the adjustment. (The blinking low light/white balance indicator should be seen in the viewfinder during adjustment.) If the automatic white balance is set accidentally, turn OFF the power switch once to reset the white balance automatically set.

2. Aim the camera at the logarithmic gray scale chart or colour chart during the adjustment so that chart fully occupies the raster of the monitor. (Fig. 4-2-1)

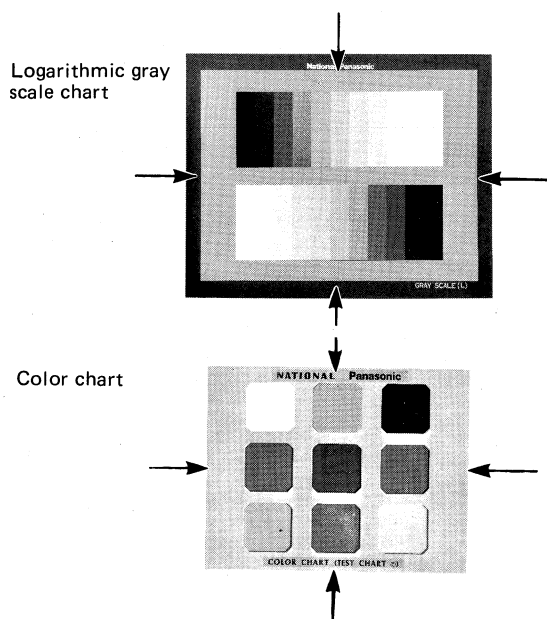


Fig. 4-2-1

(1) +7.6V adjustment

Test point : TP4 (+7.6V)	Deflection board
Adjust : VR1 (+7.6V ADJ)	Deflection board

- Connect the digital voltmeter to the +7.6V TP4.
- Adjust +7.6V ADJ VR1 for $7.6V \pm 0.015V$.

Steps denoted by shaded outlines do not have to be performed if only pick-up tube is replaced.

(2) 17MHz adjustment

Test points :	TP4 (VCO)	Sync-1 board
	TP5 (OSC)	Sync-1 board
Adjusts :	CT1	Sync-1 board
	(17MHz ADJ)	
	VL7	Sync-1 board
	(VCO ADJ)	

- Connect the frequency counter to the OSC TP5.
- Adjust 17MHz ADJ CT1 for $17,734,475.0Hz \pm 30Hz$.
- Connect the digital voltmeter to the VCO TP4.
- Adjust VCO ADJ VL7 for $3.0V \pm 0.2V$.

(3) Vertical reset pulse phase adjustment

Test points :	TP1 (G/L)	Sync-1 board
	TP2 (3FP)	Sync-2 board
	TP7 (VR)	Sync-1 board
Adjusts :	VR1	Sync-2 board
	(THIRD FIELD ADJ)	
	VR3	Sync-2 board
	(V RESET PULSE PHASE)	

Supply the colour bar or black burst signal to GEN-LOCK connector on the rear of camera from the signal generator or Special Effects Generator.

Connect the oscilloscope to the G/L TP1 and the 3FP TP2.

Trigger the oscilloscope at V.rate. (Use Vs TP8 on process board.)

Observe the third field signal and gen-lock burst signal.

Adjust THIRD FIELD ADJ VR1 so that the center point of first burst signal is located at the center point of the third field signal width. (Fig. 4-2-2)

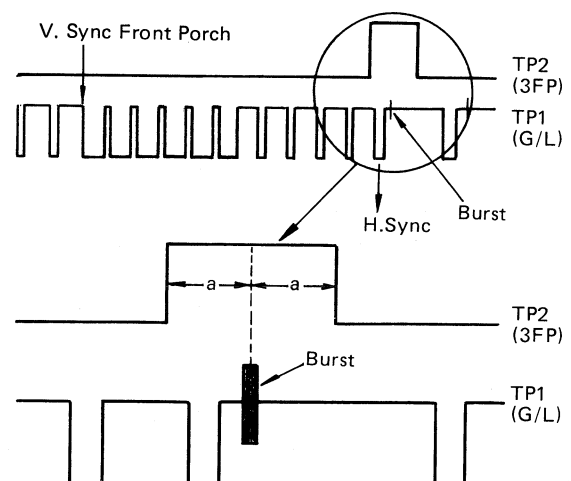


Fig. 4-2-2

- Change the probe from 3FP TP2 to VR TP7.
- Expand the second V reset trigger portion.
- Adjust V RESET PULSE PHASE VR3 so that the delay timing of V reset trigger matches that of last point of V sync signal. (Fig. 4-2-3)

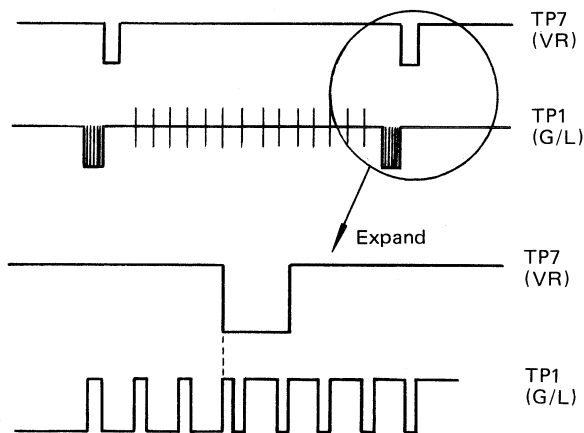


Fig. 4-2-3

(4) Colour lock adjustment

Test point :	TP3 (SC)	Sync-1 board
Adjust :	CT2	Sync-1 board
	(COLOUR LOCK)	

- Keep the colour bar or black burst signal connected as in the preceding step.
- Connect the oscilloscope to SC TP3.
- Set the oscilloscope input coupling selector to DC position.
- Turn COLOUR LOCK CT2 clockwise and counter-clockwise and note the variation of DC level.
- Adjust CT2 for center DC level of noted variation level.
- Reset the oscilloscope input coupling selector to AC position.

(5) Horizontal phase adjustment

Test points :	TP1 (G/L)	Sync-1 board
	Pin 5 of E2	Sync-1 board
	(SYNC IN)	
Adjust :	VR2	Sync-1 board
	(H.PHASE)	

- Keep the colour bar or black burst signal connected as in the preceding step.
- Connect the oscilloscope to G/L TP1 and SYNC IN pin 5 of E2.
- Trigger the oscilloscope at H rate. (Use Hs TP9 on process board.)
- Expand the H sync period on the oscilloscope.
- Confirm that the sync of gen-lock signal at G/L TP1 leads by more than $0.1 \mu\text{sec}$ and lags more than $1.5 \mu\text{sec}$ sync signal at pin 5 of E2 as H.PHASE VR2 is turned through its range. (Fig. 4-2-4)

Steps denoted by shaded outlines do not have to be performed if only pick-up tube is replaced.

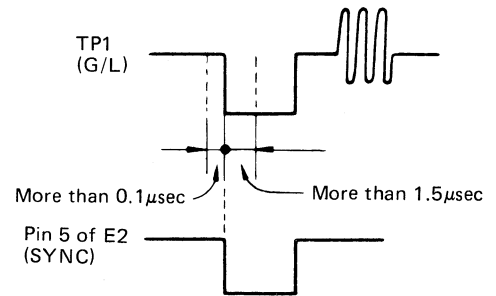


Fig. 4-2-4

(6) Confirmation of subcarrier phase

Test point :	VIDEO OUT	
Adjusts :	SW1, SW2	Sync-1 board
	(SC PHASE COARSE SWITCH)	
	VR4	Sync-1 board
	(SC PHASE FINE)	
Observe :	Vectorscope	

- Keep the Color Bar or Black Burst signal connected as in the preceding step.
- Aim the camera at the colour chart.
- Supply an external subcarrier signal to the external subcarrier reference (EXT CW ϕ REF) connector of vectorscope from the signal generator or Special Effects Generator.
- Set the burst mode (ϕ REF) of the vectorscope to the EXT position.
- Set SC PHASE COARSE SWITCH SW1 and SW2 to the 0° position and turn SC PHASE FINE VR4 fully counterclockwise.
- Confirm that the burst phase changes more than 90° , 180° and 270° when SC PHASE COARSE SWITCH SW1 and SW2 are set to the 90° , 180° and 270° position. (Fig. 4-2-5)
- Confirm that the burst phase changes more than 90° , when VR4 is turned back. (The burst phase changes more than 360° by setting SW1, SW2 and VR4.)
- Reset SW1 and SW2 to the 0 position and return VR4 fully counterclockwise.
- Disconnect the Color Bar or Black Burst signal from the GEN-LOCK connector, and the external sub-carrier signal from the vectorscope.

SC Phase	0°	90°	180°	270°
Position of Switches	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

Fig. 4-2-5

(7) Beam alignment adjustment

Test points :	Pin 1 of CN1	Process board
	(R-YL)	
	Pin 3 of CN1	Process board
	(B-YL)	
Adjusts :	VR15 (FOCUS)	Deflection board
	Alignment magnets	Coil assembly

- Set the YL ON/OFF switch to OFF position.
- Aim the camera at the white chart. Assure even and sufficient illumination.
- Turn DYNAMIC FOCUS VR9 through VR12 and VR15 on Correction board to their mechanical center.
- Also turn SIGNAL SHADING VR1 through VR8 on Correction board to their mechanical center.
- Connect the oscilloscope to pin 1 of CN1 and pin 3 of CN1.
- Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board.)
- Adjust FOCUS VR15 so that the center portions of R and B signal waveforms at pins 1 and 3 of CN1 become maximum. (Fig. 4-2-6)

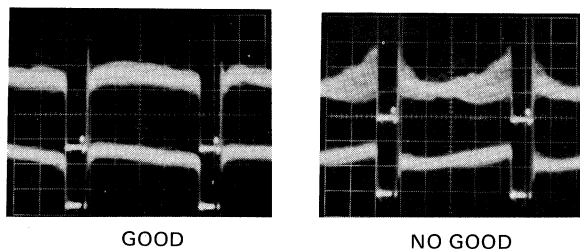


Fig. 4-2-6

- Adjust alignment magnets of Coil assembly (see Fig. 4-2-7) and stop when both signal waveforms become maximum at the same time (They peak simultaneously). (Fig. 4-2-8)

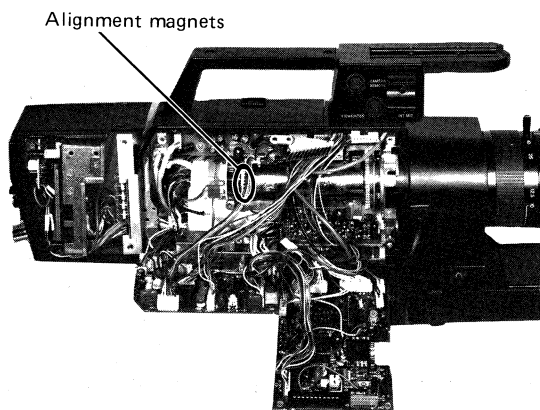
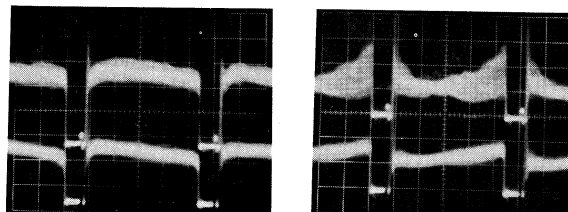


Fig. 4-2-7



GOOD

NO GOOD

Fig. 4-2-8

Confirm that the R and B signal waveforms decrease simultaneously as FOCUS VR15 is turned. If not, readjust alignment magnets.

(8) Target voltage adjustment

Test point :	TP5 (VT)	Deflection board
Adjust :	VR10 (TARGET)	Deflection board

- Connect the digital voltmeter to TARGET TP5.
- Adjust TARGET VR10 so that the voltage at TARGET TP5 is equal to $E_{sj} + A$ V. (See Note.).

Note : 1. The target voltage of pick-up tube should be adjusted while referring to Table 4-2-1.

Room Temperature	Target Voltage [$E_{sj} + A$]
Less than 41°F (5°C)	$E_{sj} + 11.0$ (V)
Between 41°F (5°C) and 50°F (10°C)	$E_{sj} + 8.5$ (V)
Between 50°F (10°C) and 59°F (15°C)	$E_{sj} + 6.5$ (V)
Between 59°F (15°C) and 68°F (20°C)	$E_{sj} + 4.5$ (V)
Between 68°F (20°C) and 77°F (25°C)	$E_{sj} + 3.8$ (V)
Between 77°F (25°C) and 86°F (30°C)	$E_{sj} + 2.3$ (V)
More than 86°F (30°C)	$E_{sj} + 1.0$ (V)

Table 4-2-1

2. The value of optimum target voltage E_{sj} is stamped on the pick-up tube neck. (Fig. 4-2-9)

In order to check the E_{sj} value of pick-up tube, which already inserted into the coil assembly, the shield case should be removed by unscrewing the two screws. (Fig. 4-2-10)

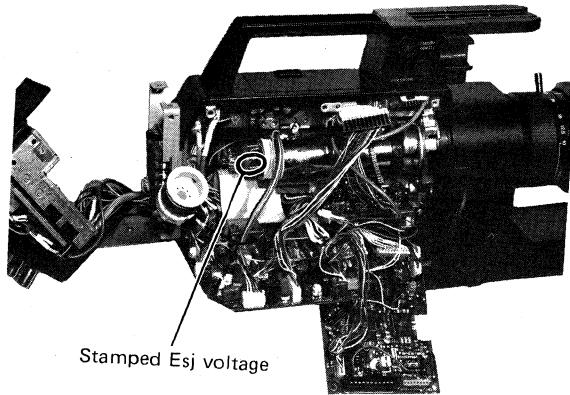


Fig. 4-2-9

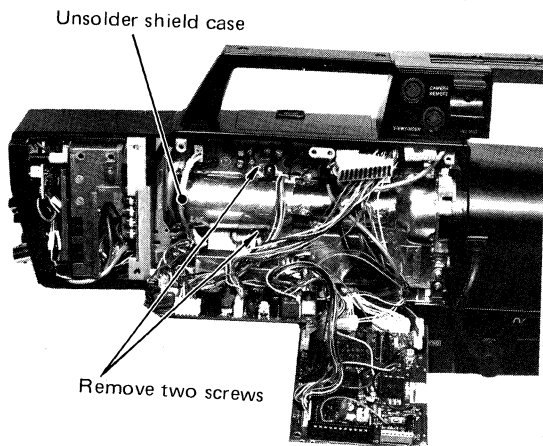


Fig. 4-2-10

(9) Focus coarse adjustment

Test point : TP1 (PREAMP OUT) Process board
Adjust : VR15 (FOCUS) Deflection board
Observe : Colour monitor

- Aim the camera at white chart.
- Connect the oscilloscope to PREAMP OUT TP1. Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board.)
- Adjust FOCUS VR15 so that the carrier (5.0MHz) on centre portion of the prevideo signal becomes maximum. (Fig. 4-2-11)
- Make sure that the minimum green colour on the centre portion of monitor screen.

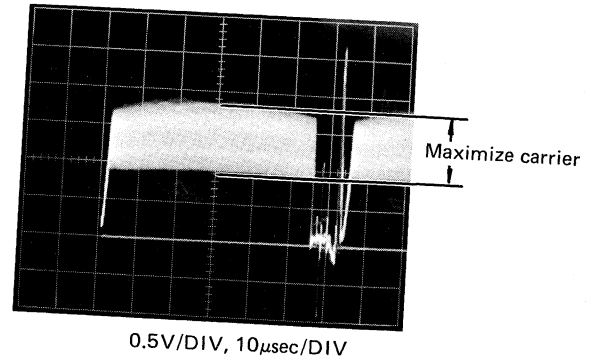


Fig. 4-2-11

(10) Beam current adjustment

Test point : TP1 (PREAMP OUT) Process board
Adjust : VR14 (BEAM) Deflection board

- Connect the oscilloscope to PREAMP OUT TP1.
- Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board.)
- Aim the camera at the scene which contains a high intensity object and turn the Auto Iris control on the right bottom cover of the camera to Open (●) position.
- Adjust BEAM VR14 until the waveform is clipped at 2.4V p-p $\pm 0.1V$ p-p. (Fig. 4-2-12) If the signal does not increase up to 2.4 Vp-p, aim the camera at a brighter object.
- Reset the Auto Iris control to Centre position.

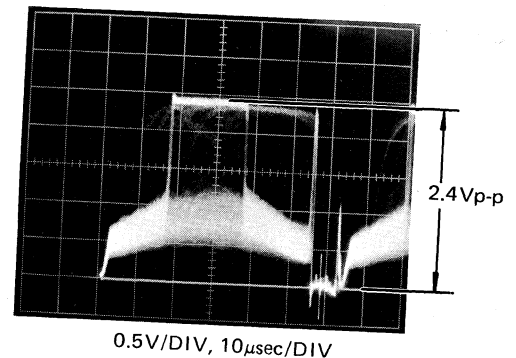


Fig. 4-2-12

(11) Pick-up tube rotation adjustment

Test point : TP1 (PREAMP OUT) Process board
Adjust : Pick-up tube

- Remove five screws and unsolder three points holding the shield plates for coil holder and bias light, and remove them. (Fig. 4-2-13)

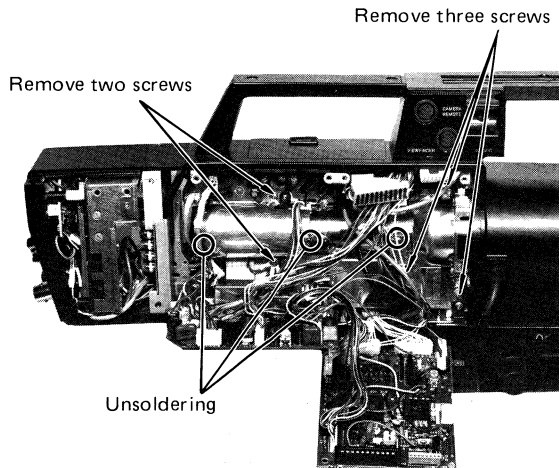


Fig. 4-2-13

- Note :**
1. The ground lead for the pick-up tube socket must be installed on the deflection coil.
 2. Three ground wires must be re-installed on the chassis.

Loosen the pick-up tube holding screw. (Fig. 4-2-14)

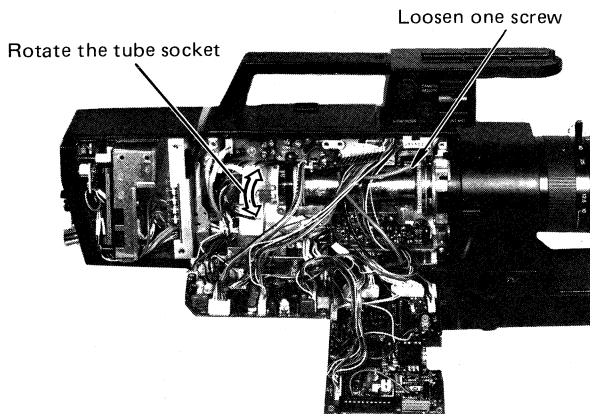


Fig. 4-2-14

- Aim the camera at the white chart.
- Connect the oscilloscope to PREAMP OUT TP1 on the process board.
- Trigger the oscilloscope at V.rate. (Use Vs TP8 on process board.)
- Expand to line select 2H periods from the center of the waveform by using the delayed sweep mode of oscilloscope.
- Rotate the pick-up tube by means of the pick-up tube socket and stop at the point where the waveform is flattest. (Fig. 4-2-15)

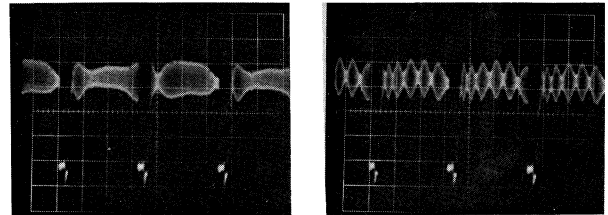


Fig. 4-2-15

- Carefully tighten the pick-up tube holding screw and make sure that the waveform remains properly adjusted.
- Re-install the shield plates with five screws and three points of soldering.

(12) Focus fine adjustment

Test point : TP1 (PREAMP OUT)	Process board
Adjust : VR15 (FOCUS)	Deflection board
Observe : Colour monitor	

- Aim the camera at white chart.
- Connect the oscilloscope to PREAMP OUT TP1.
- Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board)
- Adjust FOCUS VR15 so that the carrier (5.0MHz) on centre portion of the prevideo signal becomes maximum. (Fig. 4-2-16)
- Make sure that the minimum green colour on the centre portion of monitor screen.

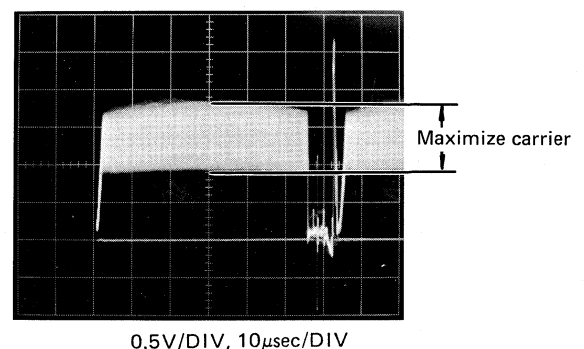


Fig. 4-2-16

(13) Backfocus adjustment

Adjust :	Backfocus adjusting ring
Observe :	Colour monitor

- Remove four screws and unsolder one point holding the shield plate and remove the coil holder shield plate. (Fig. 4-2-17)

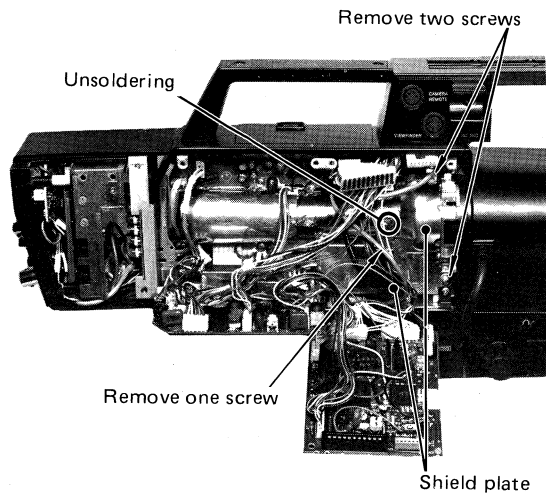


Fig. 4-2-17

- Aim the camera at the dark object further than 6 feet (2m) from the camera.
- Turn the Auto Iris control to the Open (●) position.
- Zoom in (close up/telephoto) and adjust the focus by turning the lens focus.
- Zoom out (Wide angle) and adjust the focus by turning the backfocus adjusting ring. (Fig. 4-2-18)
- Zoom in again and adjust the focus by turning the lens focus.
- Zoom out again and adjust the focus by turning the backfocus adjusting ring.
- Repeat this procedure until the focus tracks throughout the zoom range.
- Reset the Auto Iris control to the centre position.
- Replace the shield plate of backfocus adjust ring, then attach it to the chassis with two screws and solder the two points.

Note : Turn OFF the power switch on the power supply unit whenever remove or replace the shield plate.

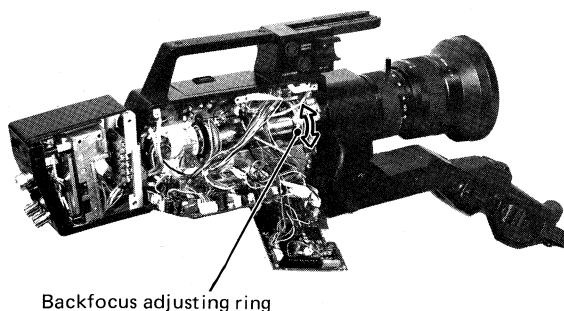


Fig. 4-2-18

(14) Vertical size and vertical centring adjustment

Test point : TP1 (PREAMP OUT)	Process board
Adjusts : VR5 (V.SIZE)	Deflection board
VR6 (V.CENT)	Deflection board

- Aim the camera at the white chart.
- Connect the oscilloscope to PREAMP OUT TP1.
- Trigger the oscilloscope at V.rate. (Use Vs TP8 on process board.)
- Adjust V. SIZE VR5 for minimum beat during the vertical period. (Fig. 4-2-19)

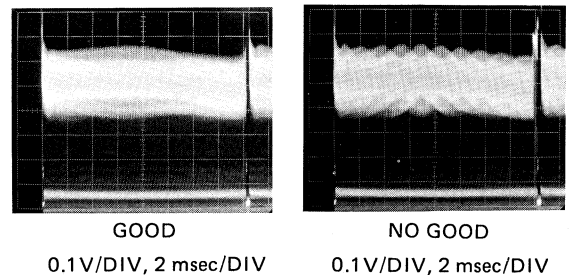


Fig. 4-2-19

- Turn H.CENT VR4 on deflection board fully counterclockwise.
- Turn H.SIZE VR2 on deflection board fully clockwise. The optical black and arrow maker appear on the oscilloscope.
- While observing the waveform, adjust V.CENT VR6 so that the marker which shows the vertical centre of pick-up tube positions at the centre of video signal waveform in vertical rate. (Fig. 4-2-20)

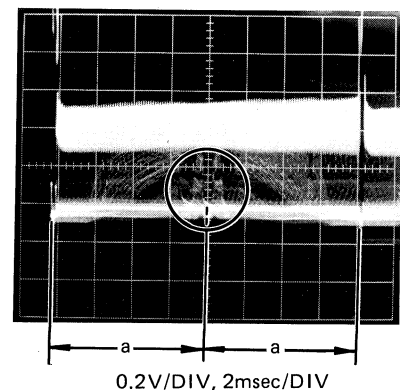


Fig. 4-2-20

Note : When adjust the vertical centring using with the underscanning monitor, adjust V.CENT VR6 so that the arrow marker shows the vertical centre of the monitor.

- Turn back H.SIZE VR2 to its mechanical centre and H.CENT VR4 until the optical black and arrow marker disappear.

(15) Horizontal size and horizontal linearity adjustment

Test point : TP3 (YH)	Process board
Adjusts : VR2 (H.SIZE)	Deflection board
VR3 (H.LIN-2)	Deflection board
VL5 (H.LIN-1)	Deflection board

- Aim the camera at white chart.
- Connect the oscilloscope to YH TP3.
- Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board)
- Adjust H.SIZE VR2 so that the carrier (5.0MHz) on the centre portion of the YH signal at YH TP3 is minimum. (Fig. 4-2-21)
- Adjust H.LIN-2 VR3 so that the starting portion of YH signal at YH TP3 is flat. (Fig. 4-2-22)
- Adjust H.LIN-1 VL5 so that the carrier (5.0MHz) on the YH signal is minimum.
- Repeat adjusting H.SIZE VR2, H.LIN-2 VR3 and H.LIN-1 VL5 until the carrier on the YH signal is minimum, the starting portion of YH signal is flat and picture has minimum disturbance on the left side.

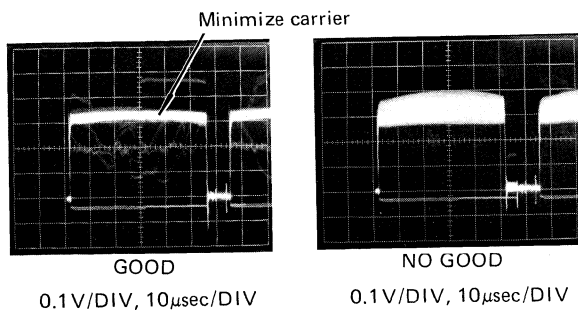


Fig. 4-2-21

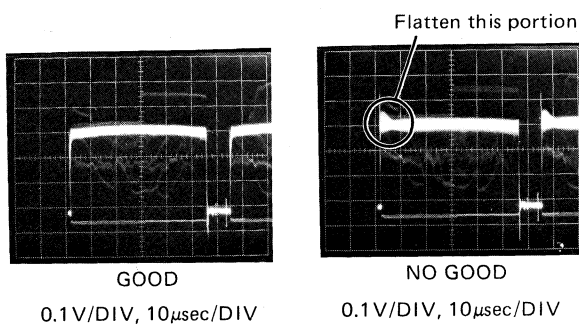


Fig. 4-2-22

(16) Horizontal centring adjustment

Test points : TP1 (PREAMP OUT)	Process board
TP9 (Hs)	Process board
Adjust : VR4 (H.CENT)	Deflection board

- Aim the camera at the white chart.
- Connect the oscilloscope to PREAMP OUT TP1 and Hs TP9.
- Trigger the oscilloscope at H.rate. (Use Hs TP2 on deflection board.)
- Expand the horizontal blanking period on the oscilloscope.
- Adjust H.CENT VR4 until the optical black width is $4.0 \mu\text{sec} \pm 0.1 \mu\text{sec}$. (Fig. 4-2-23) If the falling edge of the waveform corresponding to the picture is noisy, adjust for the middle.

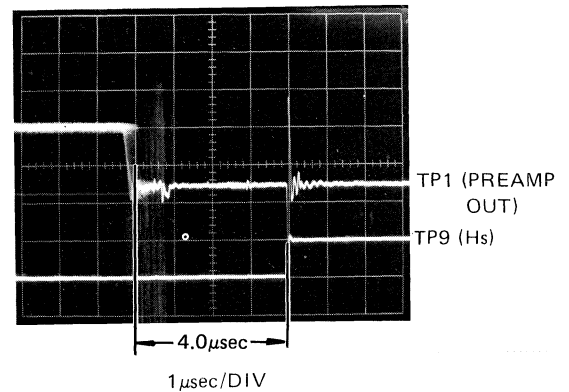


Fig. 4-2-23

(17) Bias light adjustment

Test point : TP1 (PREAMP OUT)	Process board
Adjust : VR13 (BIAS LIGHT)	Deflection board

- Cap on the lens.
- Connect the oscilloscope to PREAMP OUT TP1.
- Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board.)
- Adjust BIAS LIGHT VR13 so that the bias current is $35\text{mV} \pm 5\text{mV}$. (Fig. 4-2-24)

Note : If there is bias light (current) shading, adjust the level at the centre of the waveform.

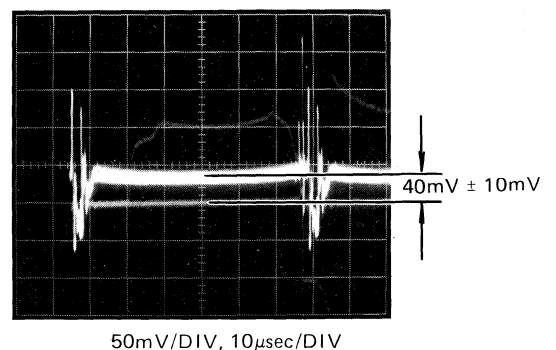


Fig. 4-2-24

(16) Dynamic focus adjustment

Test point :	TP1	Process board
	(PREAMP OUT)	
Adjusts :	VR9 (DF-V PARA)	Correction board
	VR10 (DF-V SAW)	Correction board
	VR11 (DF-H PARA)	Correction board
	VR12 (DF-H SAW)	Correction board
	VR15 (DF-H LEFT)	Correction board
	VR16	Correction board
	(DF-H LEFT BIAS)	
	VR15 (FOCUS)	Deflection board
Observe :	Colour monitor	

- Aim the camera at the logarithmic gray scale chart.
- Connect the oscilloscope to PREAMP OUT TP1.
- Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board.)
- Adjust FOCUS VR15 so that the carrier (5MHz) on the prevideo signal becomes maximum. (Fig. 4-2-25)

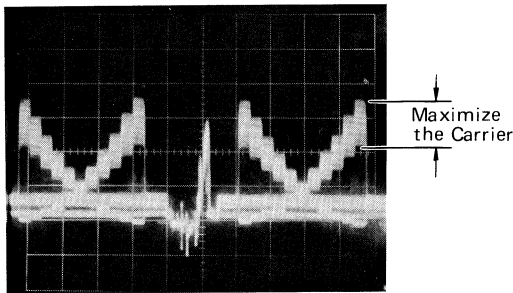


Fig. 4-2-25

- Aim the camera at the white chart.
- Observe the colour monitor and adjust for best white balance at the center of the screen using Colour balance control VR on side of camera.
- Increase colour monitors chroma gain for better viewing. Make sure the monitors is converged properly.
- Adjust DF-V PARA VR9, DF-V SAW VR10, DF-H PARA VR11 and DF-H SAW VR12 to minimize green in the corners and edges of the picture. (Fig. 4-2-26)
- Adjust DF-H LEFT VR15 and DF-H LEFT BIAS VR16 so that the vertical green stripe at the left side of colour monitor is reduced to a minimum. (Fig. 4-2-27)
- Set the Colour balance control VR to center (click) position.
- Overall focus is affected by dynamic focus correction. So readjust the focus control VR15 on deflection board intermittently while performing dynamic correction.

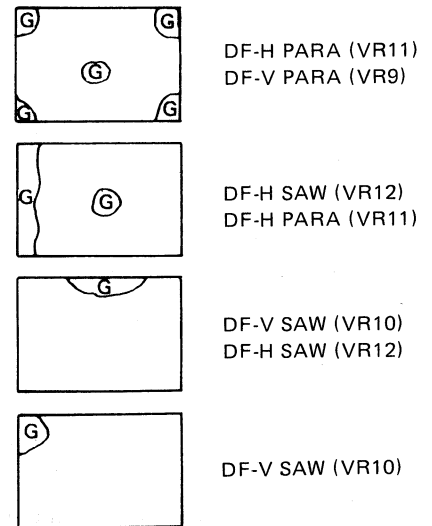


Fig. 4-2-26

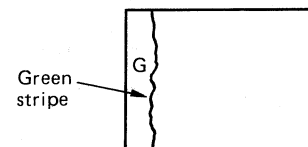


Fig. 4-2-27

(19) Bias light shading (Bs) correction adjustment

Test point :	TP5 (VIDEO)	Process board
Adjusts :	VR9 (Bs V.SAW)	Deflection board
	VR8 (Bs V.PARA)	Deflection board
	VR7 (Y PED)	Deflection board
	VR13 (Bs-H SAW)	Correction board
	VR14 (Bs-H PARA)	Correction board

- Set the AGC switch on the right side of the grip arm to ON position.
- Cap on the lens.
- Connect the oscilloscope to VIDEO TP5.
- Trigger the oscilloscope at V.rate. (Use Vs TP8 on process board.)
- Turn Y PED VR7 fully clockwise.
- Adjust Bs V.PARA VR8 and Bs V.SAW VR9 so that the dark signal waveform is as flat as possible. (Fig. 4-2-28)

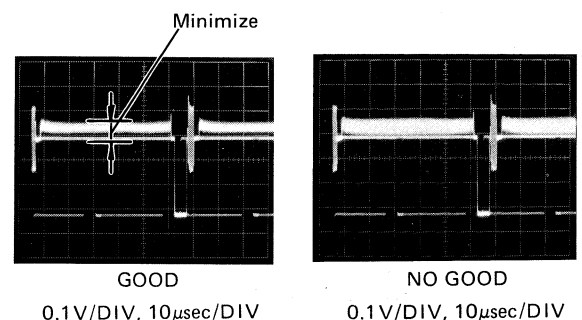


Fig. 4-2-28

- Trigger the oscilloscope at H.rate. (Use TP9 on process board.)
- Adjust Bs-H SAW VR13 and Bs-H PARA VR14 so that the dark signal waveform is as flat as possible. (Fig. 4-2-29)

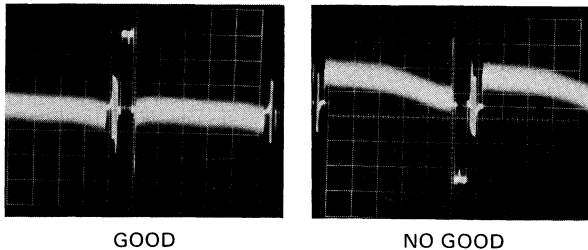
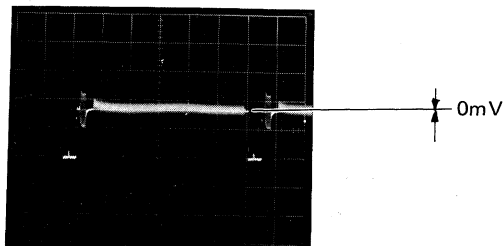


Fig. 4-2-29

- Adjust Y PED VR7 so that the pedestal level at VIDEO TP5 becomes $0 \pm 10\text{mV}$ (Fig. 4-2-30)



50mV/DIV, 10μsec/DIV

Fig. 4-2-30

- Confirm that the pedestal level does not change by operating AGC switch ON/OFF. If changed, readjust Y PED VR7 so that the pedestal level does not change by operating AGC switch ON/OFF.

(20) AIC level adjustment

Test point :	TP2 (TRACKING)	Process board
Adjust :	VR3 (AIC SET)	Process board

- Aim the camera at the logarithmic gray scale chart.
- Connect the oscilloscope to TRACKING TP2.
- Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board.)
- Adjust AIC SET VR3 so that the waveform is $0.5\text{V} \pm 0.02\text{V}$ from the blanking level to the top step of the gray scale waveform. (Fig. 4-2-31)

Steps denoted by shaded outlines do not have to be performed if only pick-up tube is replaced.

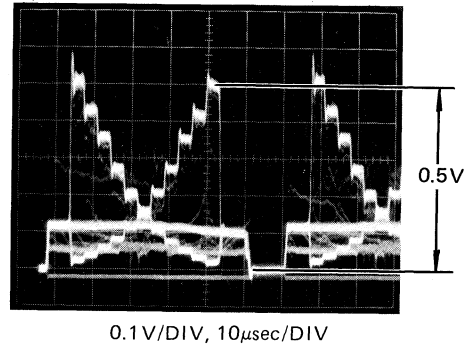


Fig. 4-2-31

(21) AGC/MANUAL gain adjustment

Test point :	TP3 (YH)	Process board
Adjusts :	VR1 (MANUAL GAIN)	Process board
	VR2 (AGC SET)	Process board

- Aim the camera at the gray scale chart.
- Set the AGC switch to ON position.
- Connect the oscilloscope to YH TP3.
- Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board.)
- Adjust AGC SET VR2 for $0.4\text{V} \pm 0.02\text{V}$ from the blanking level to the top step of the gray scale waveform. (Fig. 4-2-32)
- Change the AGC switch to OFF position.
- Adjust MANUAL GAIN VR1 for $0.4\text{V} \pm 0.02\text{V}$ from the blanking level to the top step of the gray scale waveform. (Fig. 4-2-32)
- Confirm that the waveform does not change by operating AGC switch ON/OFF. If change readjust MANUAL GAIN VR1 and AGC SET VR2 so that the waveform does not change by operating AGC switch ON/OFF and its level is $0.4\text{V} \pm 0.02\text{V}$.

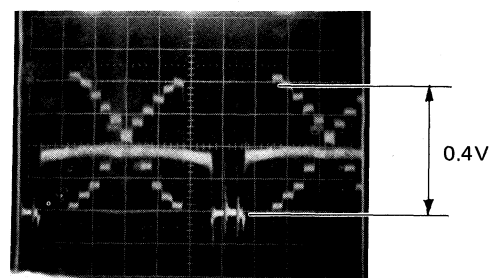


Fig. 4-2-32

(22) Vertical edge balance and vertical edge bias adjustment

Test points :	TP4 (V EDGE)	Process	board
	TP11 (1H VIDEO)	Process	board
Adjusts :	VR16 (V.EDGE BIAS)	Process	board
	VR18 (V.EDGE BALANCE)	Process	board

- Aim the camera at the logarithmic gray scale chart.
- Connect the oscilloscope to 1H VIDEO TP11.
- Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board.)
- Turn V.EDGE BIAS VR16 fully counterclockwise.
- Turn back V.EDGE BIAS VR16 slowly and stop it at the point where the distortion of the H.BL signal becomes minimum. (Fig. 4-2-33)

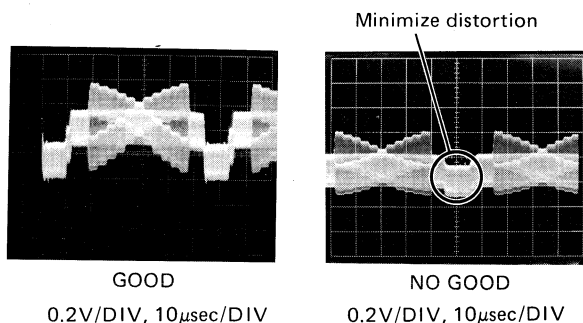


Fig. 4-2-33

- Set the input coupling selector on the oscilloscope to DC position.
- Note the DC level of the H.BL portion as (A).
- Adjust V.EDGE BIAS VR16 so that the H.BL DC level becomes (A) +0.3V. (Fig.4-2-34)

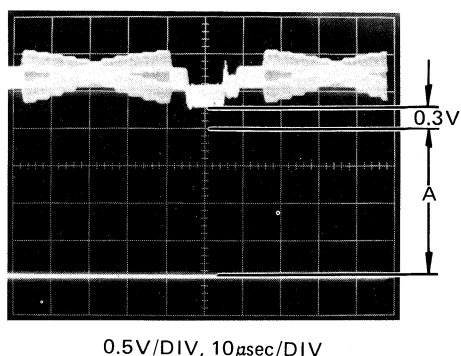


Fig. 4-2-34

- Reset the input coupling selector on the oscilloscope to AC position.
- Connect the oscilloscope to V.EDGE TP4.
- Adjust V.EDGE BALANCE VR18 to cancel the video signal. (Fig.4-2-35)

Steps denoted by shaded outlines do not have to be performed if only pick-up tube is replaced.

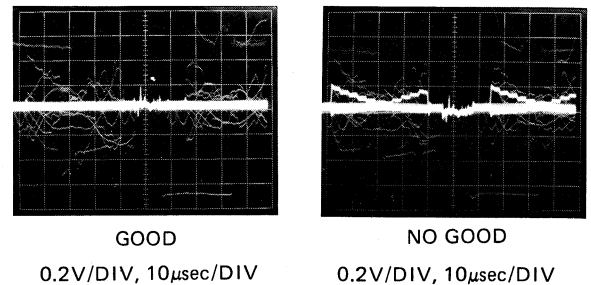


Fig. 4-2-35

(23) R and B signal separation adjustment

Test points :	Pin 3 of CN1 (B-YL)	Process	board
Adjusts :	CT2 (R/B SEPARATION-1)	Process	board
	VR5 (R/B SEPARATION-2)	Process	board

- Set the YL ON/OFF switch (SW1) on process board to OFF position.
- Aim the camera at the logarithmic gray scale chart.
- Connect oscilloscope to pin 3 of CN1.
- Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board.)
- Adjust R/B SEPARATION-1 CT2 for minimum waveform flicker. (Fig. 4-2-36)
- Adjust R/B SEPARATION-2 VR5 for the same condition.
- Repeat adjusting R/B SEPARATION-1 CT2 and R/B SEPARATION-2 VR5 until the flicker in waveform is minimum.

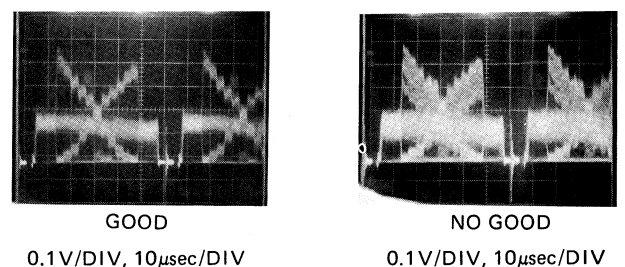


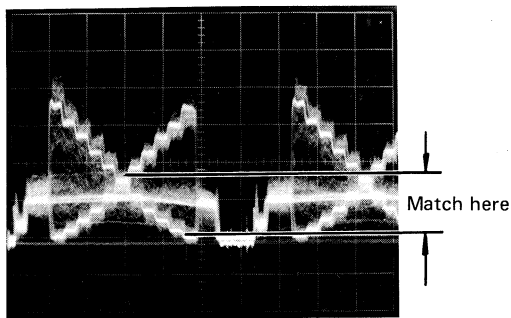
Fig. 4-2-36

Steps denoted by shaded outlines do not have to be performed if only pick-up tube is replaced.

(24) B gain and YL pedestal preset adjustment

Test points :	Pin 3 of CN1 (B-YL)	Process board
	Pin 2 of CN1 (YL)	Process board
Adjusts :	VR4 (R/B GAIN)	Process board
	VR15 (YL PED)	Process board

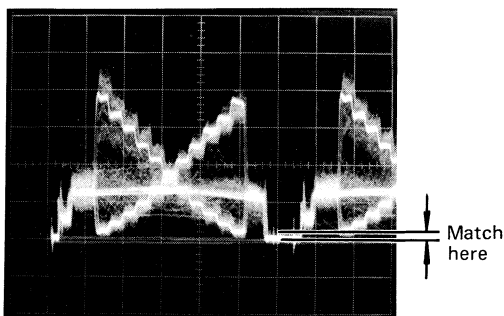
- Set the YL ON/OFF switch to OFF position.
 - Aim the camera at the logarithmic gray scale chart.
 - Connect the oscilloscope to pin 2 and pin 3 of CN1.
 - Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board.)
 - Set the colour balance control on right bottom cover to centre (click) position.
 - Turn B TRACKING-1 VR7, B TRACKING-2 VR6, B TRACKING-3 VR8, R TRACKING-1 VR10, R TRACKING-2 VR11 and R TRACKING-3 VR9 on process board to their mechanical centre.
- Note :** Before adjusting R/B GAIN VR4, if the gray scales black chip of YL signal is suppressed, turn YL PED VR15 until the black chip of YL signal can be observed.
- Overlay the R signal and YL signal on the oscilloscope, and adjust R/B GAIN VR4 so that the signal level between the black chip (zero step) and fifth step (crossing step) of gray scale waveform match. (Fig. 4-2-37)



0.1V/DIV, 10 μ sec/DIV

Fig. 4-2-37

- Next adjust YL PED VR15 so that the pedestal level of YL signal matches that of B signal. (Fig. 4-2-38)



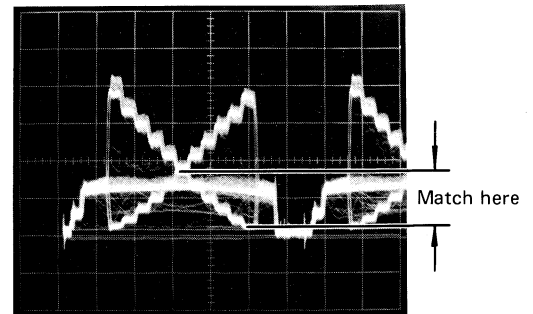
0.1V/DIV, 10 μ sec/DIV

Fig. 4-2-38

(25) R gain and R pedestal preset adjustment

Test points :	Pin 1 of CN1 (R-YL)	Process board
	Pin 2 of CN1 (YL)	Process board
Adjusts :	VR12 (R GAIN)	Process board
	VR13 (R PED)	Process board

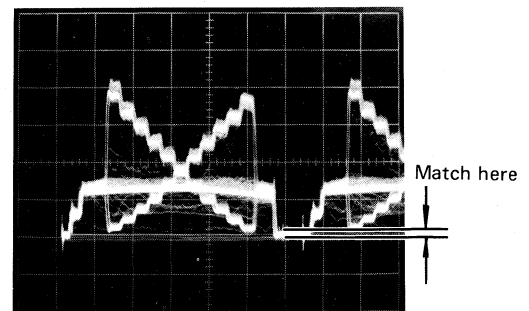
- Set the YL ON/OFF switch to OFF position.
 - Aim the camera at the logarithmic gray scale chart.
 - Connect the oscilloscope to Pin 1 and Pin 2 of CN1.
 - Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board.)
- Note :** Before adjusting R GAIN VR12, if the gray scales black chip of R signal is suppressed, turn R PED VR13 until the black chip of R signal can be observed.
- Overlay the R signal and YL signal on the oscilloscope, and adjust R GAIN VR12 so that the signal level between the black chip (zero step) and fifth step (crossing step) of gray scale waveform match. (Fig. 4-2-39)



0.1V/DIV, 10 μ sec/DIV

Fig. 4-2-39

- Next adjust R PED VR13 so that the pedestal level of R signal matches that of YL signal. (Fig. 4-2-40)



0.1V/DIV, 10 μ sec/DIV

Fig. 4-2-40

- Repeat adjusting R GAIN VR12 and R PED VR13 until the signal level between the black chip (zero step) and fifth step (crossing step), and pedestal level of gray scale waveform match.

(26) Signal shading adjustment

Test points :	Pin 1 of CN1 (R-YL)	Process board
	Pin 3 of CN1 (B-YL)	Process board
Adjusts :	VR3 (R-H.PARA)	Correction board
	VR4 (R-H.SAW)	Correction board
	VR1 (R-V.PARA)	Correction board
	VR2 (R-V.SAW)	Correction board
	VR7 (B-H.PARA)	Correction board
	VR8 (B-H.SAW)	Correction board
	VR5 (B-V.PARA)	Correction board
	VR6 (B-V.SAW)	Correction board

- Aim the camera at a white chart.

R signal shading adjustment

- Connect the oscilloscope to pin 1 of CN1 on the process board.
- Set the YL ON/OFF switch to ON position.

(1) R signal horizontal shading adjustment

- Trigger the oscilloscope at H.rate. (Use Hs TP6 on correction board.)
- Adjust R-H PARA VR3 AND R-H SAW VR4 to make the waveform as flat as possible. (Fig. 4-2-41)

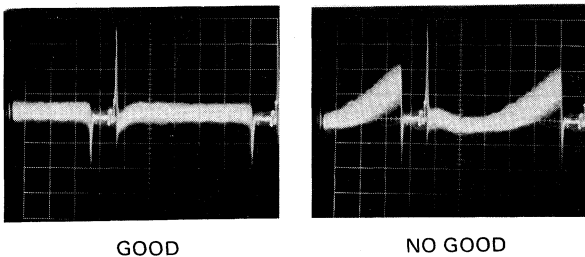


Fig. 4-2-41

(2) R signal vertical shading adjustment

- Trigger the oscilloscope at V.rate. (Use Vs TP5 on correction board.)
- ADjust R-V PARA VR1 and R-V SAW VR2 to make the waveform as flat as possible. (Fig. 4-2-42)

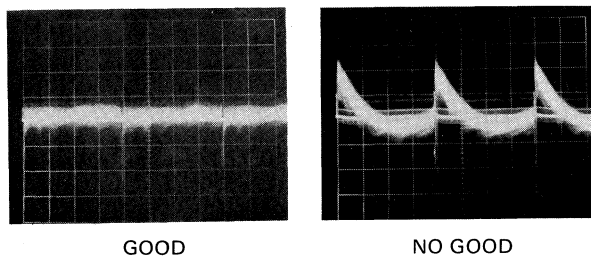


Fig. 4-2-42

B signal shading adjustment

- Connect the oscilloscope to pin 3 of CN1 on the process board.
- Set the YL ON/OFF switch to ON position.

(1) B signal horizontal shading adjustment

- Trigger the oscilloscope at H.rate. (Use Hs TP6 on correction board.)
- Adjust B-H.PARA VR7 and B-H.SAW VR8 to make the waveform as flat as possible. (Fig. 4-2-43)

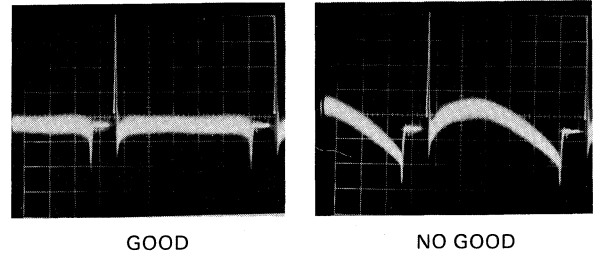


Fig. 4-2-43

(2) B signal vertical shading adjustment

- Trigger the oscilloscope at V.rate. (Use Vs TP5 correction board.)
- Adjust B-V.PARA VR5 and B-V.SAW VR6 to make the waveform as flat as possible. (Fig. 4-2-44)

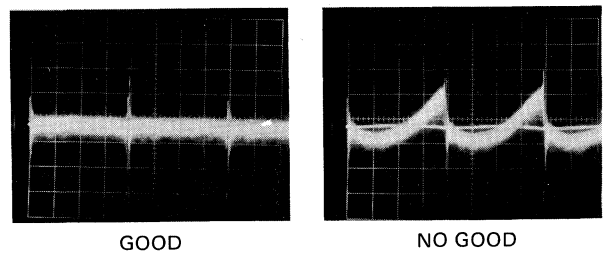


Fig. 4-2-44

(27) YL and B signal tracking adjustment

Test point :	Pin 3 of CN1 (B-YL)	Process board
Adjusts :	VR7 (B TRACKING-1)	Process board
	VR6 (B TRACKING-2)	Process board
	VR8 (B TRACKING-3)	Process board
	VR4 (R/B GAIN)	Process board

- Set the YL ON/OFF switch to ON position.
- Confirm that the B TRACKING-1 VR7, B TRACKING-2 VR6 and B TRACKING-3 VR8 are set to their mechanical centre.
- Aim the camera at the logarithmic gray scale chart.
- Connect the oscilloscope to Pin 3 of CN1.
- Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board.)
- Confirm that the centre portion of B-YL signal is minimum. If not adjust R/B GAIN VR4 on process board to minimize. (Fig. 4-2-45)

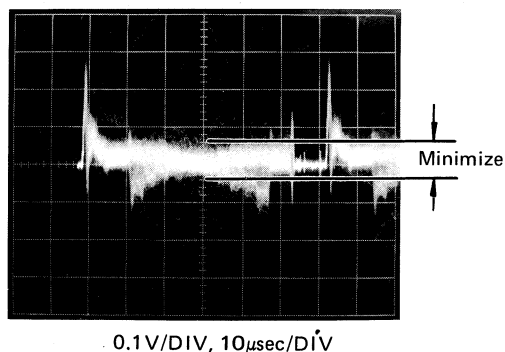


Fig. 4-2-45

- Adjust B TRACKING-1 VR7 so that the B-YL signal becomes minimum. (Fig. 4-2-46)

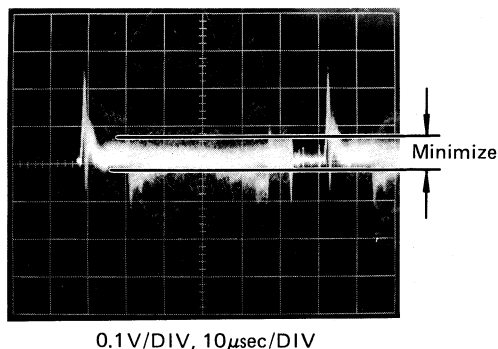


Fig. 4-2-46

- Adjust B TRACKING-2 VR6 and B TRACKING-3 VR8 so that the B-YL signal becomes minimum. (Fig. 4-2-47)

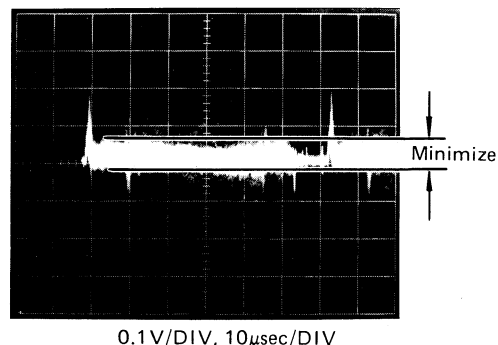


Fig. 4-2-47

- Repeat these steps until the B-YL signal becomes minimum.

(28) YL and R signal tracking adjustment

Test point :	Pin 1 of CN1 (R-YL)	Process board
Adjusts :	VR10 (R TRACKING-1)	Process board
	VR11 (R TRACKING-2)	Process board
	VR9 (R TRACKING-3)	Process board
	VR12 (R GAIN)	Process board

- Set the YL ON/OFF switch to ON position.
- Confirm that the R TRACKING-1 VR10, R TRACKING-2 VR11 and R TRACKING-3 VR9 are set to their mechanical centre.
- Aim the camera at logarithmic gray scale chart.
- Connect the oscilloscope Pin 1 of CN1.
- Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board.)
- Confirm that the centre portion of R-YL signal is minimum. If not, adjust R GAIN VR12 on process board to minimize. (Fig. 4-2-48)

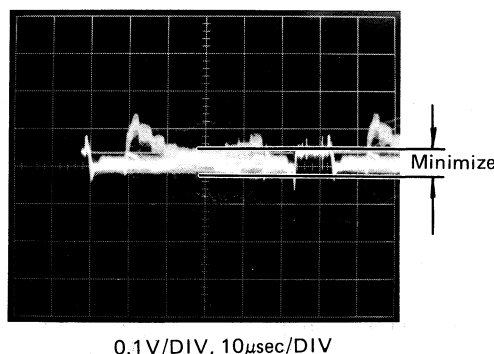
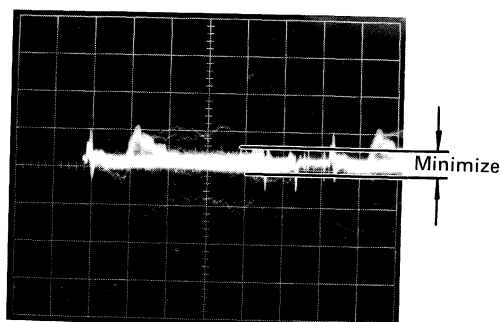


Fig. 4-2-48

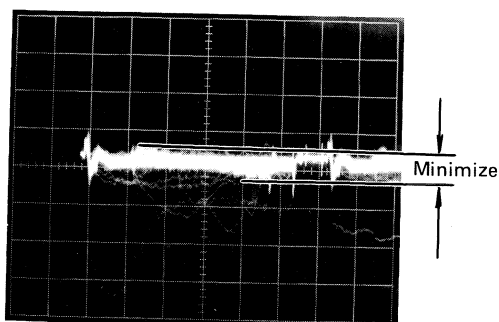
- Adjust R TRACKING-1 VR10 so that R-YL signal becomes minimum. (Fig. 4-2-49)



0.1V/DIV, 10 μ sec/DIV

Fig. 4-2-49

- Adjust R TRACKING-2 VR11 and R TRACKING-3 VR9 so that the R-YL signal becomes minimum. (Fig. 4-2-29)



0.1V/DIV, 10 μ sec/DIV

Fig. 4-2-50

- Repeat these steps until the R-YL signal becomes minimum.

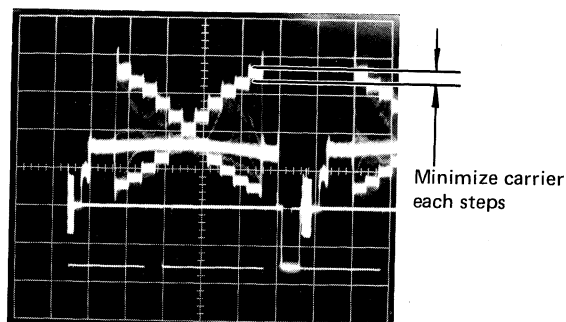
(29) YL and R/B signal tracking fine adjustment

Test point :	TP5 (VIDEO)	Process board
Adjusts :	VR4 (R/B GAIN)	Process board
	VR12 (R GAIN)	Process board
	VR7 (B TRACKING-1)	Process board
	VR6 (B TRACKING-2)	Process board
	VR8 (B TRACKING-3)	Process board
	VR10 (R TRACKING-1)	Process board
	VR11 (R TRACKING-2)	Process board
	VR9 (R TRACKING-3)	Process board

- Set the YL ON/OFF switch to ON position.
- Aim the camera at the logarithmic gray scale chart.
- Connect the oscilloscope to VIDEO TP5.
- Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board.)

Steps denoted by shaded outlines do not have to be performed if only pick-up tube is replaced.

- Fine adjust R/B GAIN VR4 so that the carrier on the fifth step (crossing step) at VIDEO TP5 becomes minimum.
- Fine adjust R GAIN VR12 for the same condition.
- Fine adjust B TRACKING-1 VR7 and R TRACKING-1 VR10 so that the carrier on the second and third steps at VIDEO TP5 becomes minimum.
- Fine adjust B TRACKING-2 VR6, R TRACKING-2 VR11, B TRACKING-3 VR8 and R TRACKING-3 VR9 so that the carrier on the eight to tenth steps becomes minimum. (Fig.4-2-51)



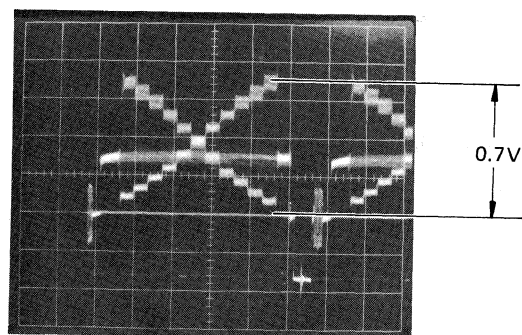
0.2V/DIV, 10 μ sec/DIV

Fig. 4-2-51

(30) Y gain adjustment

Test point :	TP5 (VIDEO)	Process board
Adjust :	VR14 (Y GAIN)	Process board

- Aim the camera at the logarithmic gray scale chart.
- Connect the oscilloscope to VIDEO TP5.
- Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board.)
- Adjust Y GAIN VR14 for 0.7V $\pm$ 0.05V from blanking level to the top step of the gray scale waveform. (Fig. 4-2-52)



0.2V/DIV, 10 μ sec/DIV

Fig. 4-2-52

(31) Chroma and Burst adjustment

Test point :	TP5 (VIDEO)	Process	board
Adjusts :	VR22 (BURST GAIN)	Process	board
	VR23 (BURST PHASE)	Process	board
	CT4 (CHROMA PHASE)	Process	board
	VR21 (CHROMA GAIN)	Process	board
	VR20 (CHROMA CLIP)	Process	board
Observe :	Vectorscope/Oscilloscope		

- Aim the camera at the logarithmic gray scale chart.
- Connect the oscilloscope to VIDEO TP5.
- Trigger the oscilloscope at H.rate. (Use Hs TP9 on process board.)
- Connect the video output to a terminated vector-scope.
- Set the YL ON/OFF switch to ON position.
- Adjust BURST PHASE VR23 so that the phase between two bursts becomes 90° each other on the vectorscope. (Fig. 4-2-53)

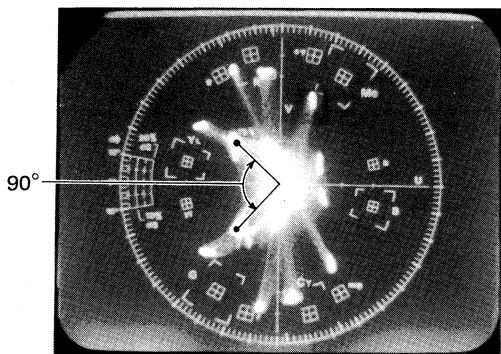


Fig. 4-2-53

- Set the vectorscope to NTSC mode.
- Make sure that the burst vector becomes 135° on the vectorscope. (Fig.4-2-54)

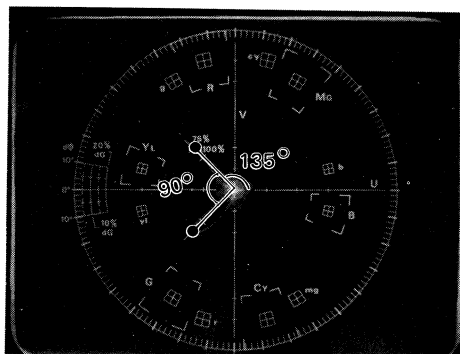


Fig. 4-2-54

Steps denoted by shaded outlines do not have to be performed if only pick-up tube is replaced.

- Adjust BURST GAIN VR22 so that the burst level is $0.3V \pm 0.01V$ on the oscilloscope. (Fig. 4-2-55)
- Adjust BURST GAIN VR22 so that the burst level becomes 75% on the vectorscope. (Fig. 4-2-56)
- Adjust CHROMA PHASE CT4 so that the two red vectors become one above another on the vector-scope.
- Turn CHROMA CLIP VR20 fully counterclockwise.
- Adjust CHROMA GAIN VR21 so that the red vector becomes 185% as compares to the burst signal on the vectorscope. (Fig. 4-2-56)

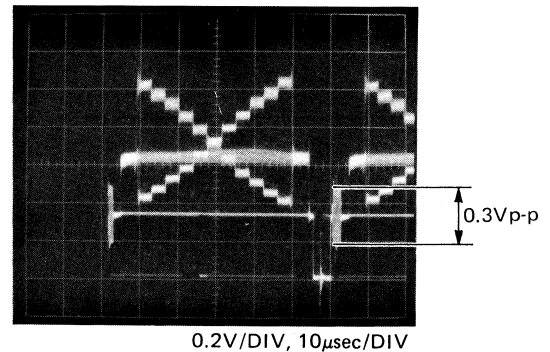


Fig. 4-2-55

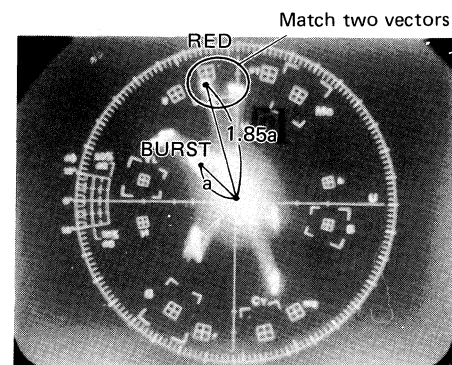


Fig. 4-2-56

- Turn the colour balance control to the R position.
- Adjust CHROMA CLIP VR20 so that the red vector clips at $225\% \pm 10\%$ as compares to the burst signal on the vectorscope. (Fig.4-2-57)

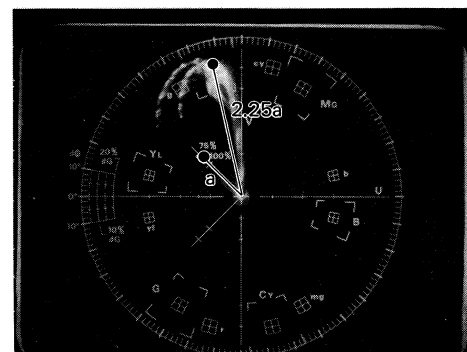


Fig. 4-2-57

- Reset the colour balance control to the centre position.

Steps denoted by shaded outlines do not have to be performed if only pick-up tube is replaced.

(32) YL phase adjustment

Adjust : CT3 (YL PHASE) Process board
Observe : Colour monitor

- Aim the camera at white set chart. (The reverse side of ball chart.)
- Adjust YL PHASE CT3 for minimum colour on the right side edge of white portion. (Fig. 4-2-58)

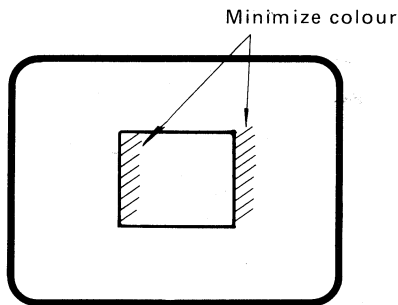


Fig. 4-2-58

(33) Title colour phase adjustment

Adjust : CT1
(TITLE COLOUR PHASE) Process board
Observe : Colour monitor
Vectorscope

- Connect the video output to a terminated vector-scope.
- Press the TITLE button on the key board (B) to observe the dots on the monitor screen.
- Repeat to press the TITLE CLR button on the key board (B) until title colour character becomes RED on the EVF screen.
- Press the KEY button on the key board (B) for red key picture on the monitor screen.
- Adjust TITLE COLOUR PHASE CT1 so that the two red vectors become one above another on the vector-scope (Fig. 4-2-59)



Fig. 4-2-59

(34) Character size adjustment

Adjust : VR1 (CHARACTER SIZE) Micro process-
or board
Observe : Colour monitor

- Press the TITLE button to observe the dot on the monitor screen.
- Press the WORD L/S button on the key board (B) to select small dots.
- Adjust CHARACTER SIZE VR1 so that the both side spaces between dots and screen edges become equal (A). (Fig. 4-2-60)

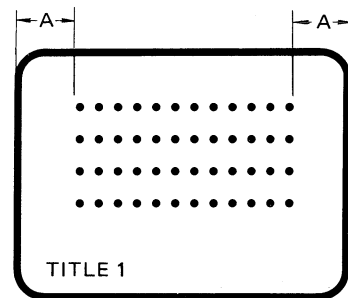


Fig. 4-2-60

(35) Timer frequency adjustment

Test point : TP1 (TIMER FREQ) Microprocessor
board
Adjust : CT1 (TIMER FREQ) Microprocessor
board

- Insert the specified battery (SUM-3, AM-3 or AA size) into backup battery compartment.
- Turn OFF the power.
- Connect the frequency counter to TIMER FREQ TP1 on Microprocessor board.
- Adjust TIMER FREQ CT1 so that the frequency at TIMER FREQ TP1 is 32,768.00(Hz).

Steps denoted by shaded outlines do not have to be performed if only pick-up tube is replaced.

4-3 Viewfinder adjustment

- The camera must be completely aligned before viewfinder adjustment is made.
- The conditions and connections for viewfinder adjustment are the same as shown in Fig. 4-1-1 on page 9.
- Refer to page 29 for the adjusting controls and test points.

(1) Picture tilt adjustment

Adjust : Deflection coil
Observe : Viewfinder

- Reduce picture size using EVF V.SIZE VR11 on deflection board and H.SIZE VL3 on EVF board.
- Loosen the deflection coil holding screw. (Fig. 4-3-1)

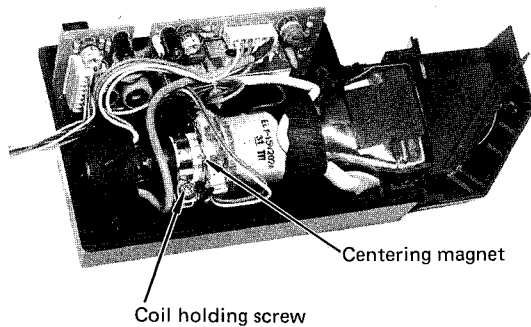


Fig. 4-3-1

- Cap on the lens.
- Observe the viewfinder, and turn the deflection coil until the raster is straight.
- Tighten the deflection coil holding screw.

(2) Centring magnets adjustment

Adjust : Centring magnet
Observe : Viewfinder

- Aim the camera at the ball chart.
- Adjust the centring magnets (See Fig. 4-3-1) until the centre of picture (raster) becomes to the centre of the viewfinder screen. (Fig. 4-3-2)

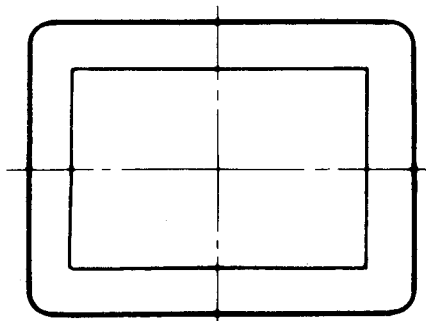


Fig. 4-3-2

(3) EVF V.SIZE and H.SIZE adjustment

Adjusts : VR11 (EVF V.SIZE) Deflection board
VL3 (H.SIZE) EVF board
Observe : Viewfinder

- Aim the camera at the ball chart, and line up the reference arrow head with edge of the raster (blanking) on the viewfinder. (Fig. 4-3-3)
- Adjust H.SIZE VL3 to a point where the ball charts edges just disappear on the viewfinder. (Fig. 4-3-3)
- Then adjust EVF V.SIZE VR11 so that the circle in the chart is nearly a true circle.

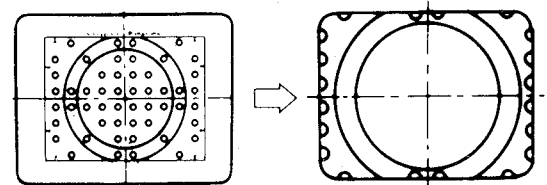


Fig. 4-3-3

(4) Contrast and brightness adjustment

Adjusts : VR2 (BRIGHT) EVF board
VR3 (CONTRAST) EVF board
Observe : Viewfinder

- Aim the camera at the logarithmic gray scale chart.
- Adjust BRIGHT VR2 and CONTRAST VR3 so that the black and white chip gradations will be the same on the viewfinder screen as that in the monitor.

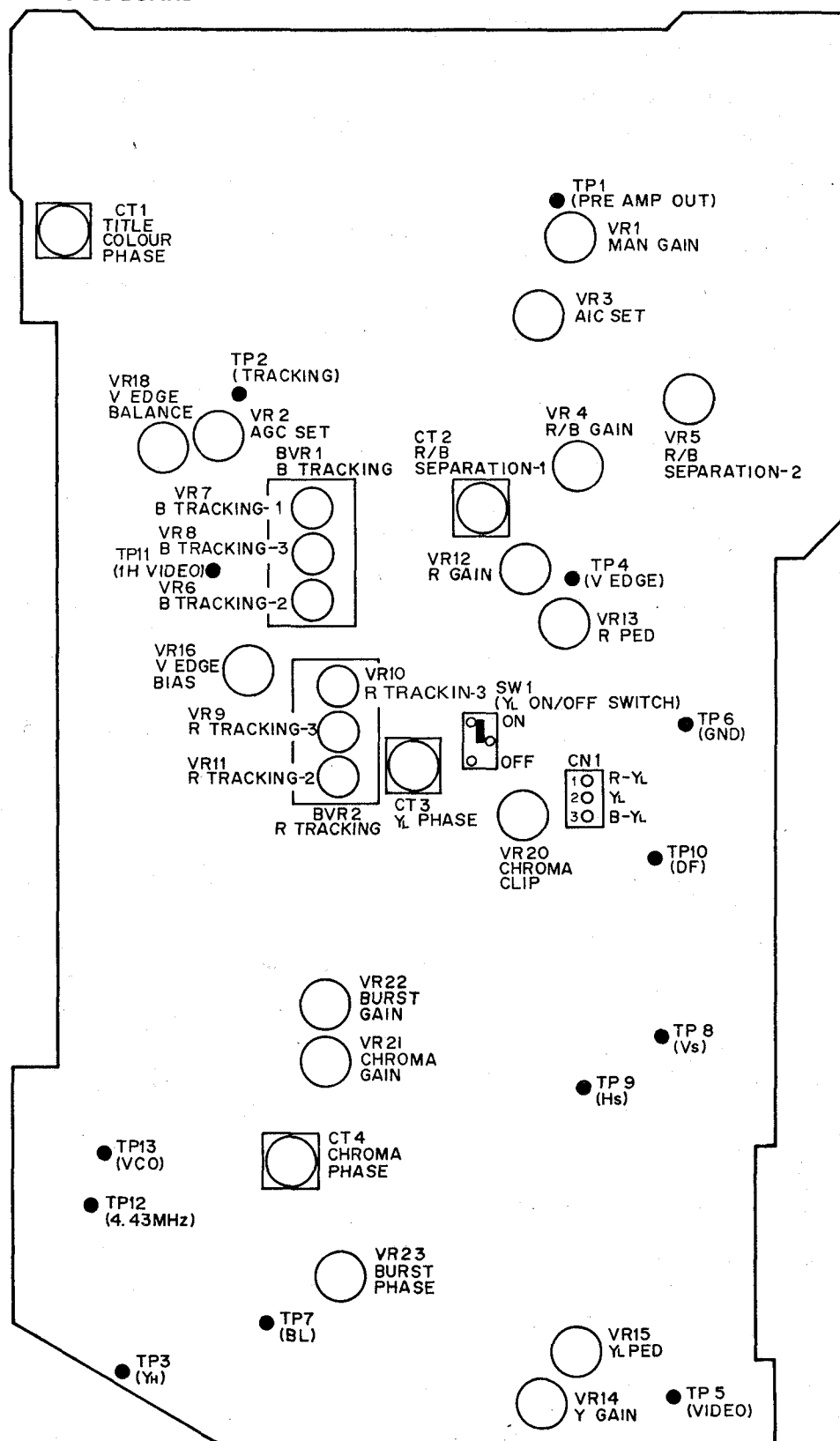
(5) Focus adjustment

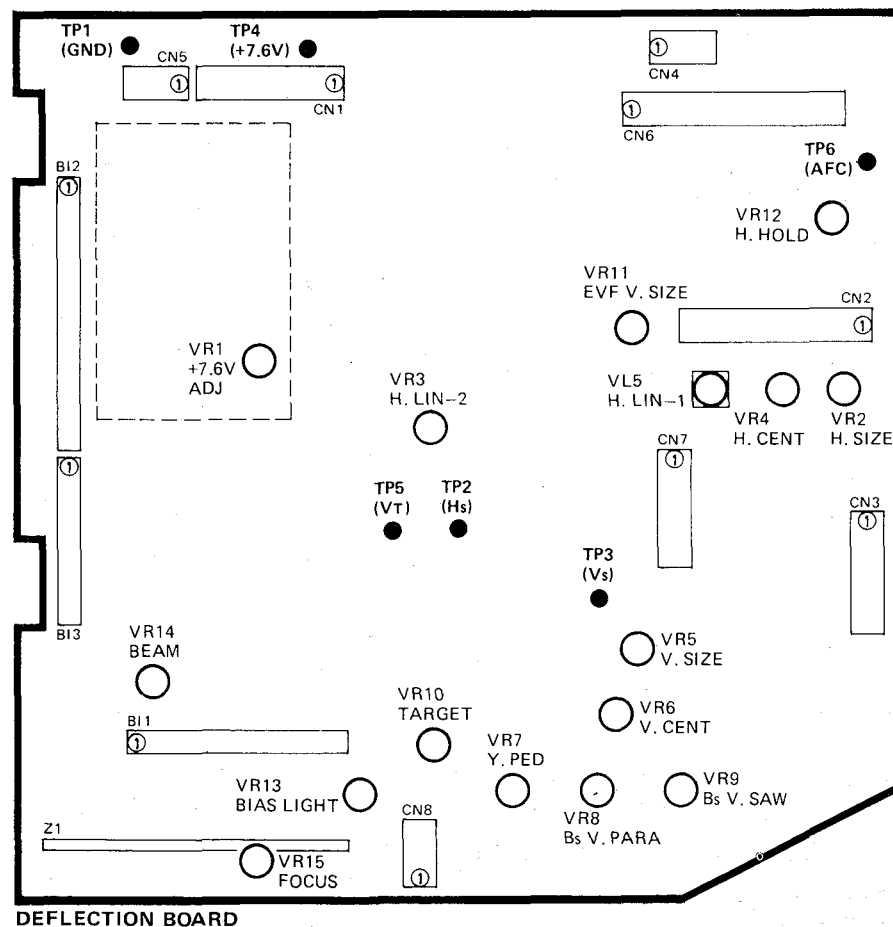
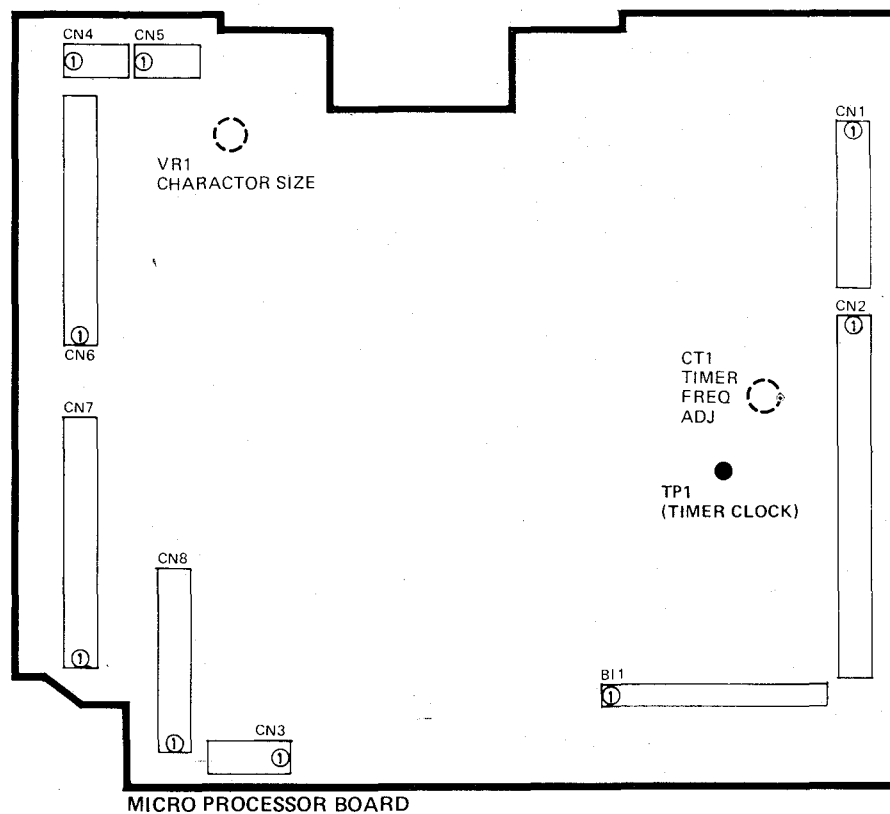
Adjust : VR1 (FOCUS) EVF board
Observe : Viewfinder

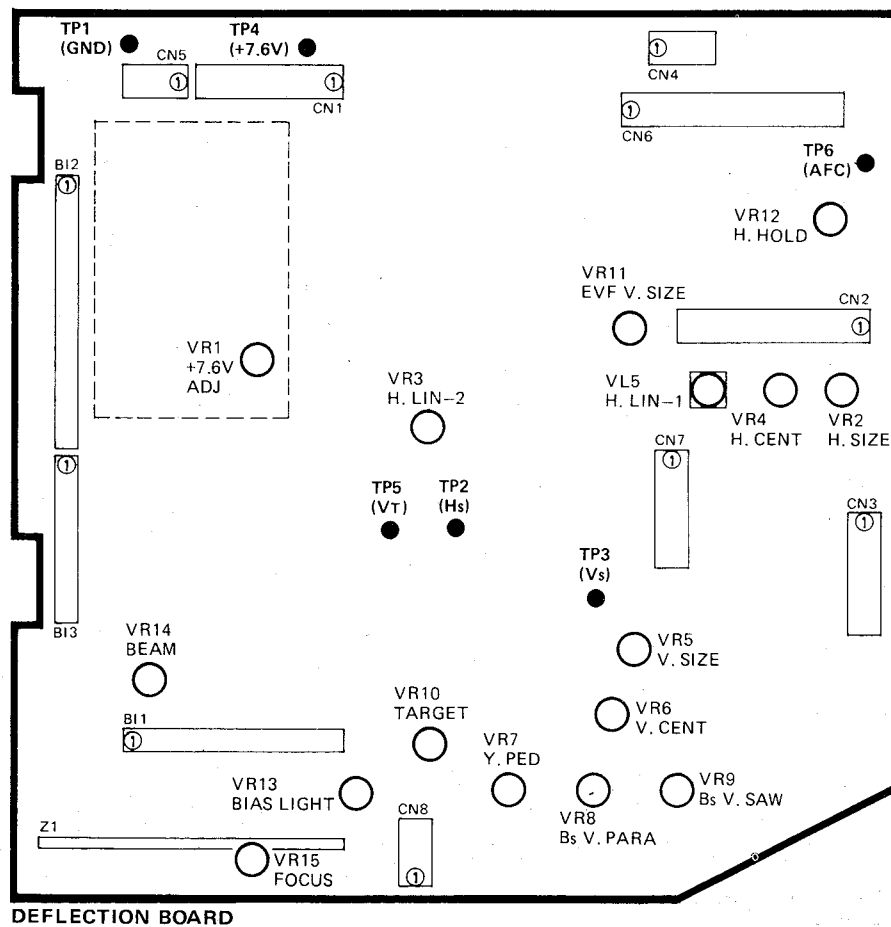
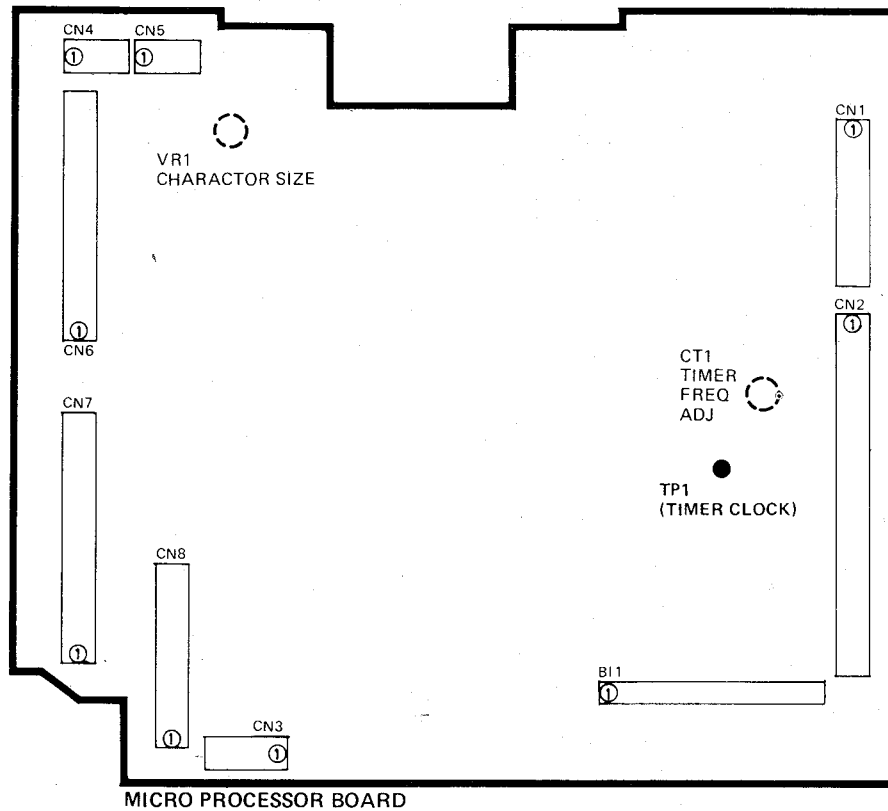
- Aim the camera at ball chart.
- Adjust FOCUS VR1 for best resolution in the viewfinder.

5. LOCATION OF TEST POINTS AND ADJUSTING CONTROLS

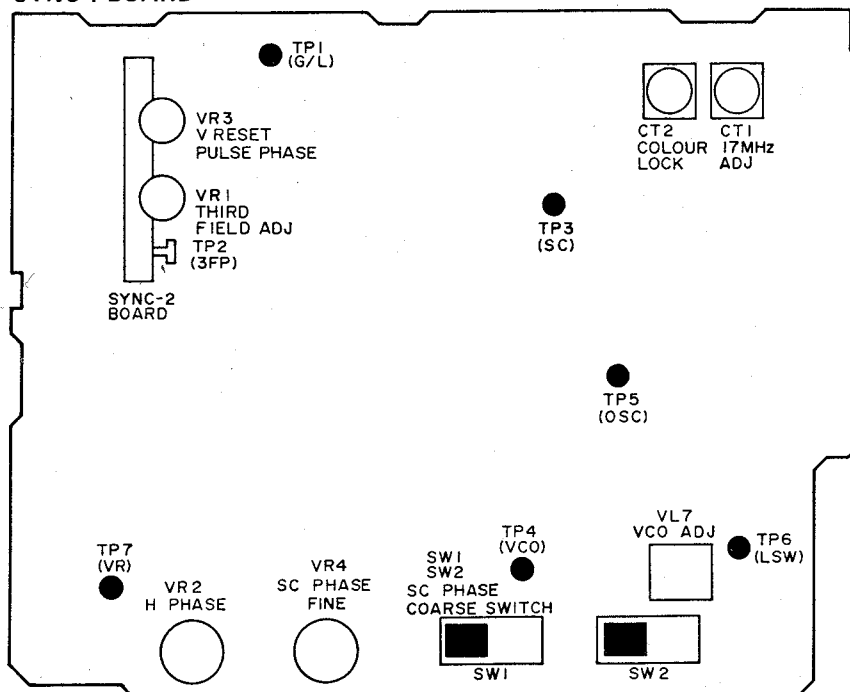
PROCESS BOARD



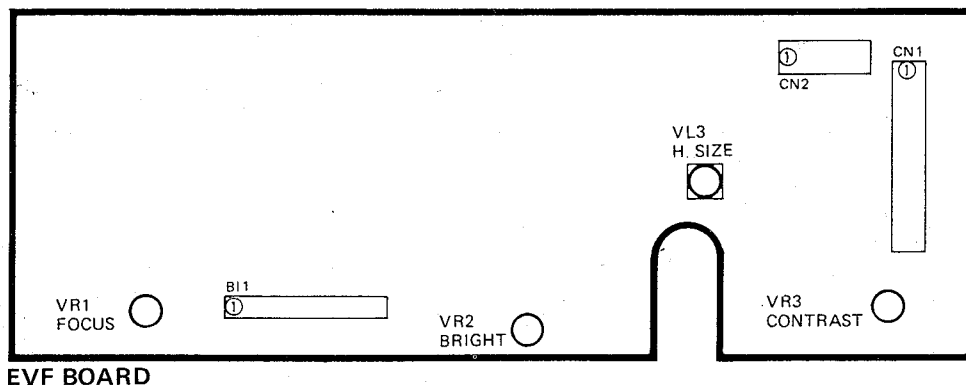
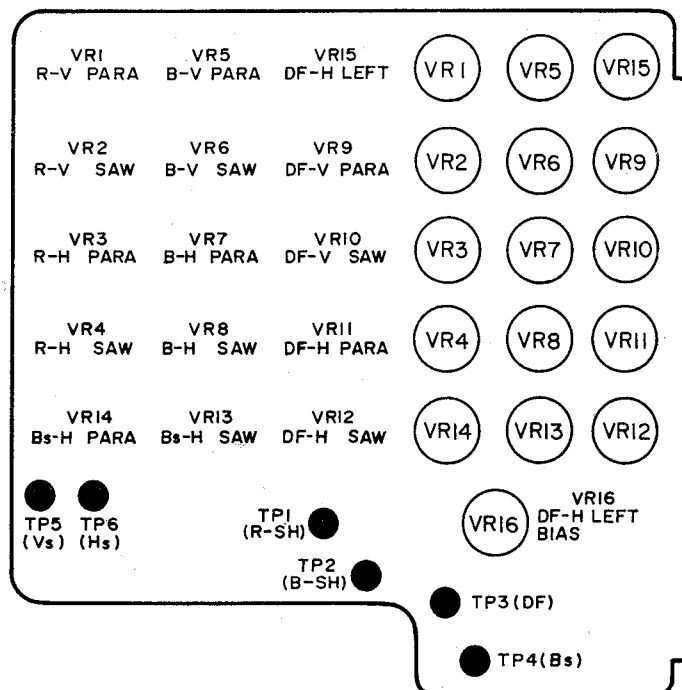




SYNC-1 BOARD



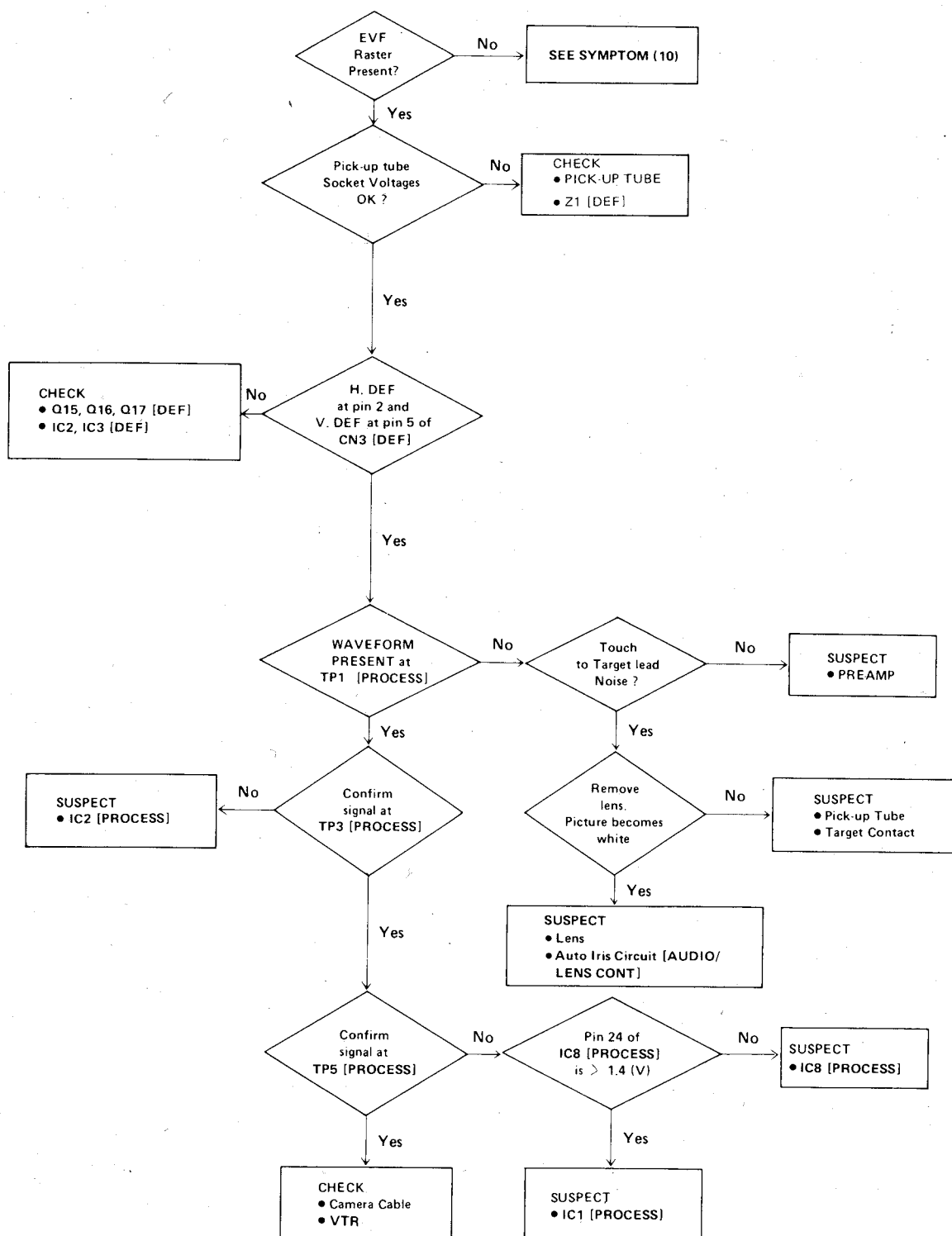
CORRECTION BOARD



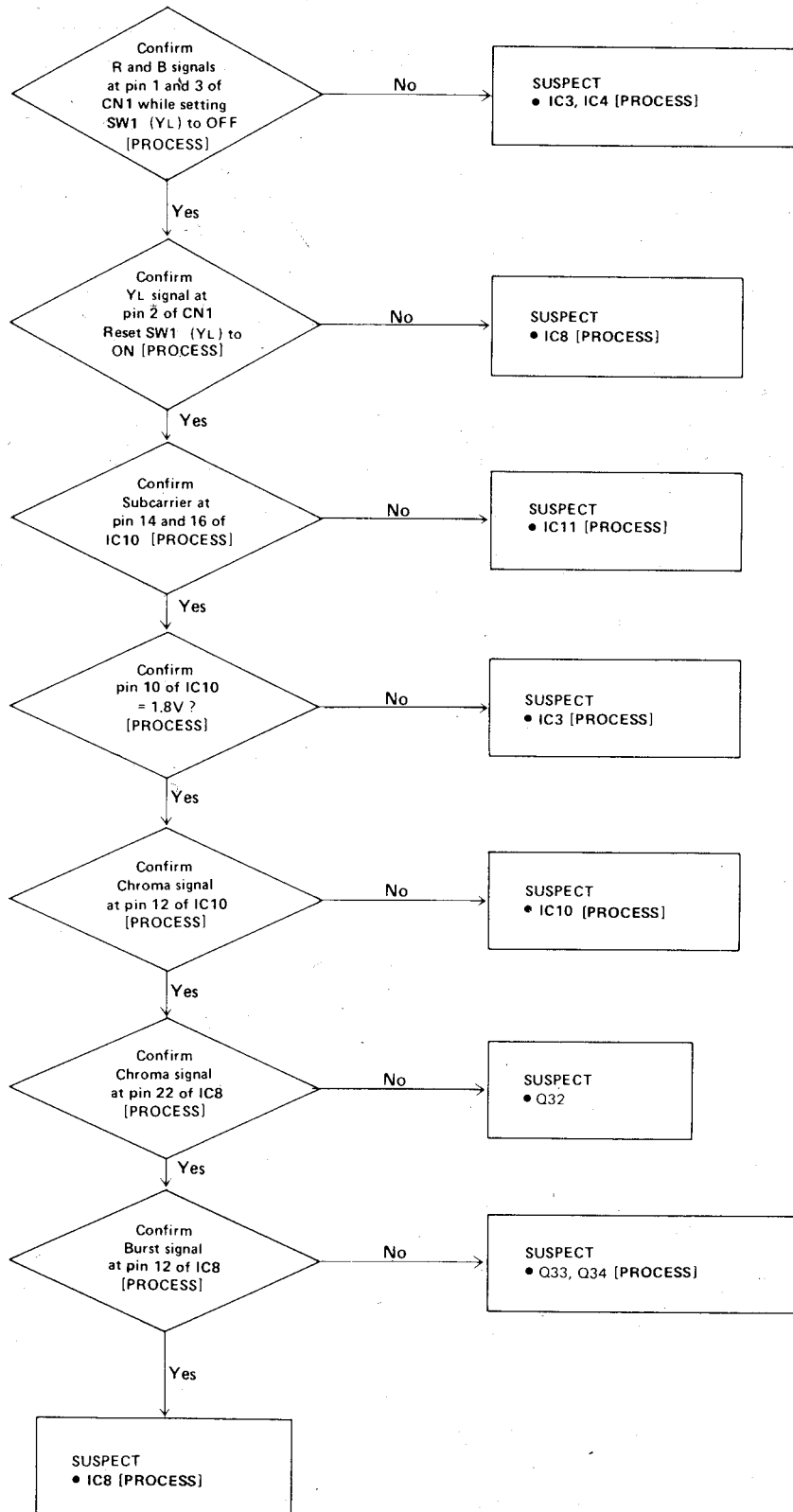
EVF BOARD

6. TROUBLESHOOTING GUIDE

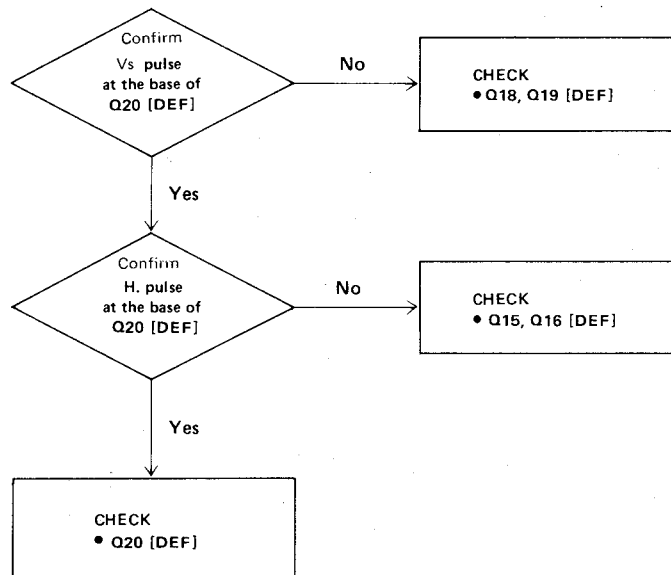
SYMPTOM (1) : No Video (Luminance) on Electronic Viewfinder or Monitor



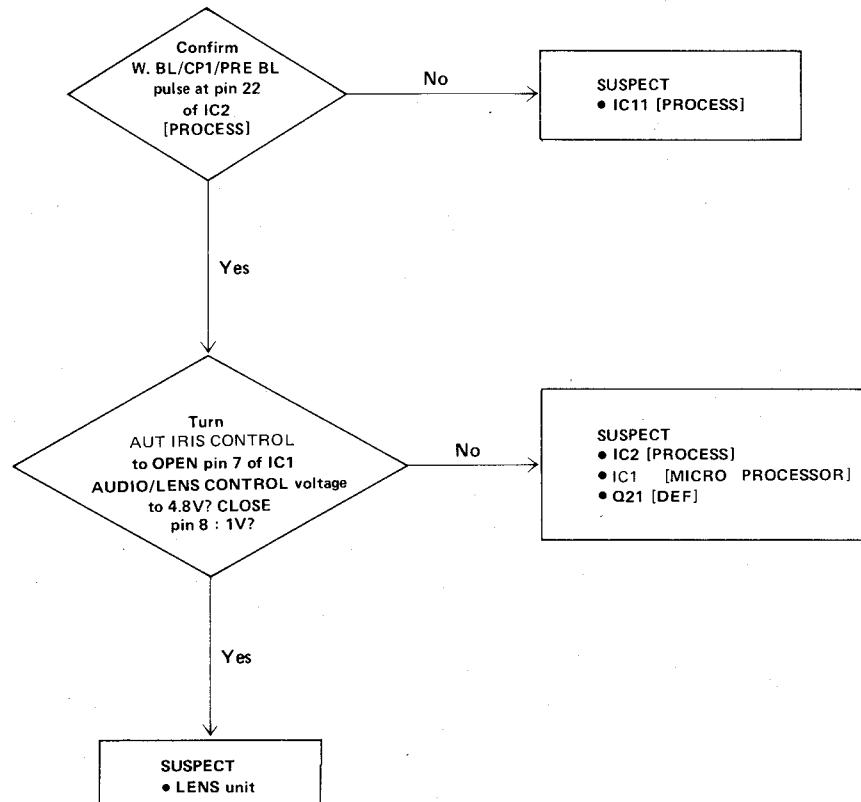
SYMPTOM (2) : No Colour on Monitor



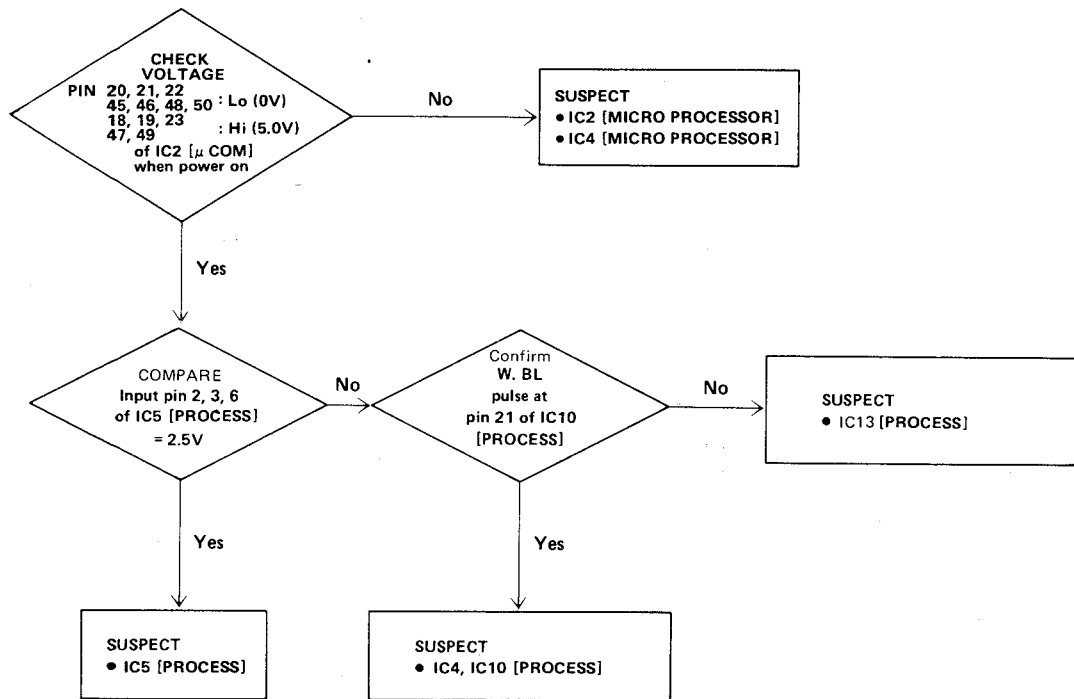
SYMPTOM (3) : Retrace Line in Electronic Viewfinder and Monitor



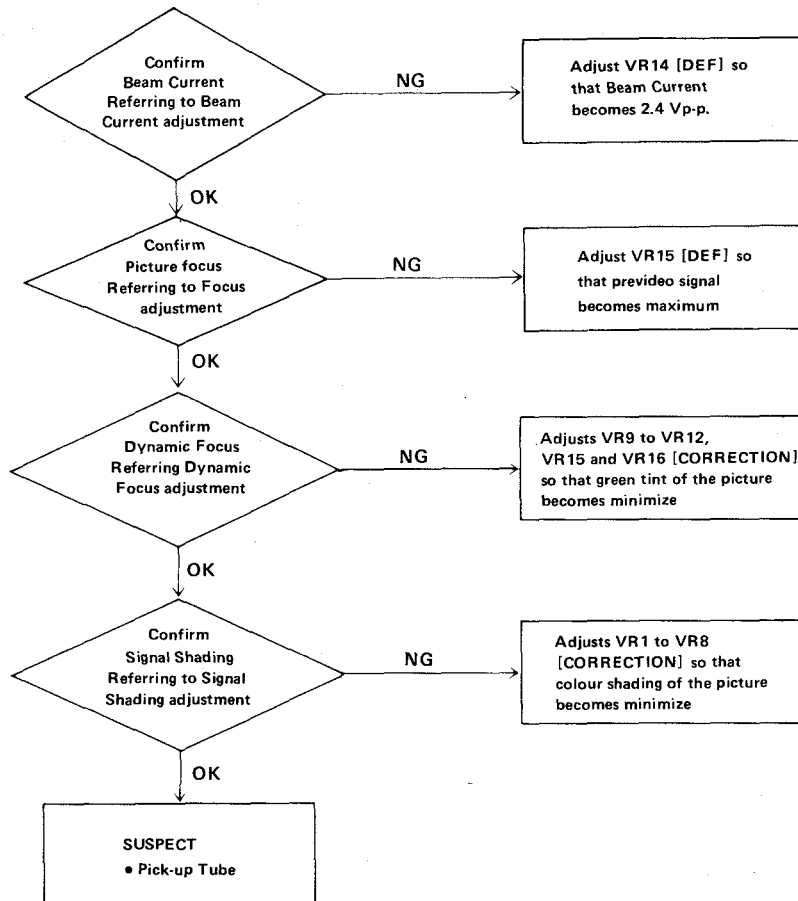
**SYMPTOM (4) : Video Level Too High/Low
White Picture Areas Blooming
No/Incorrect Iris Operation**



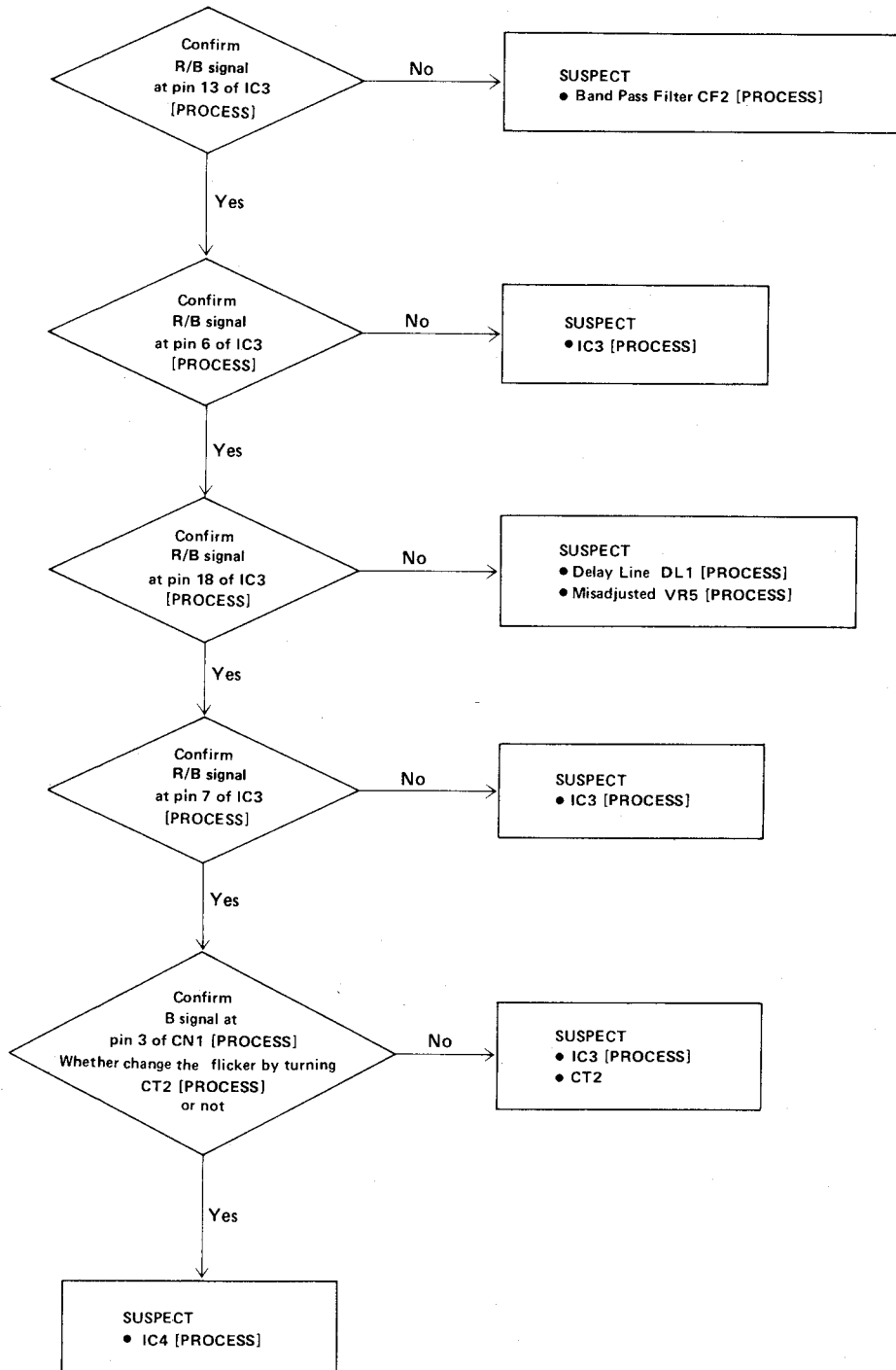
**SYMPTOM (5) : Incorrect White Set Operation
Red, Blue, or Green Tinted Picture**



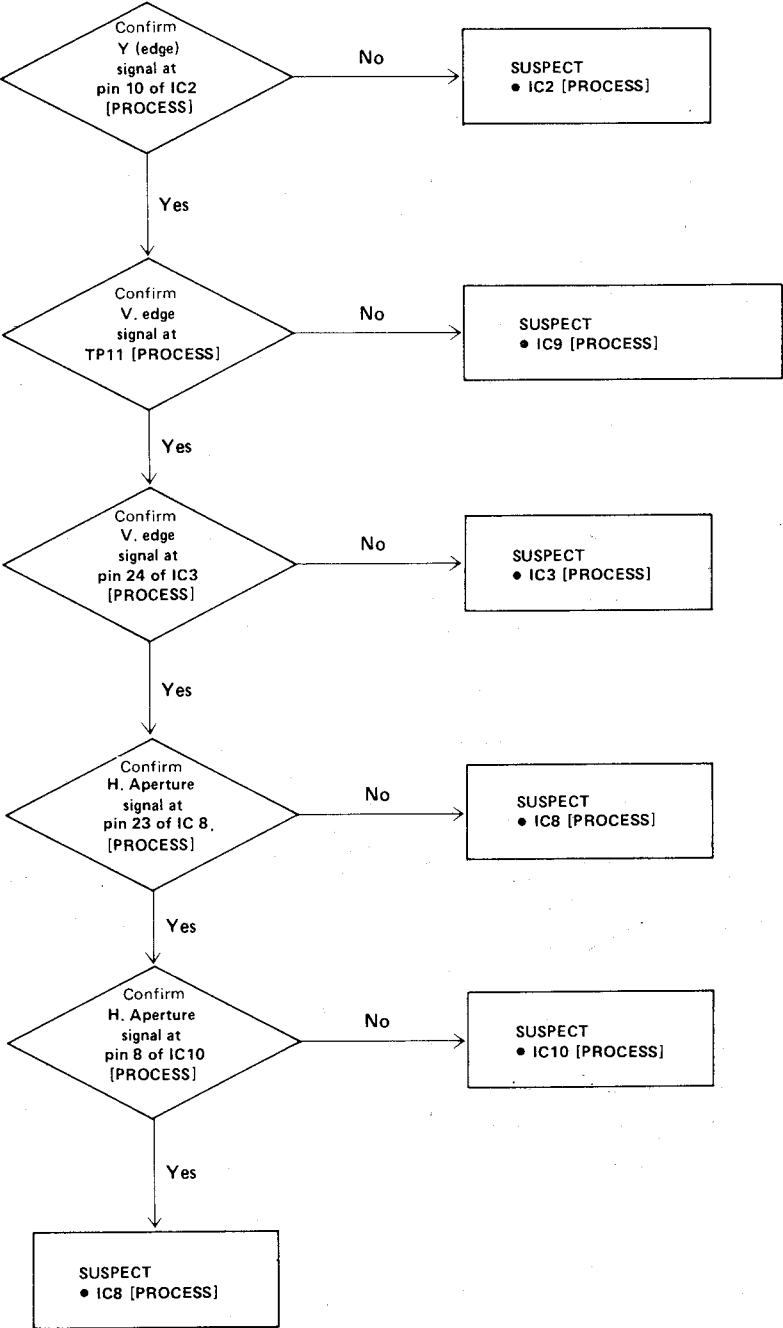
SYMPTOM (6) : Colour Shading



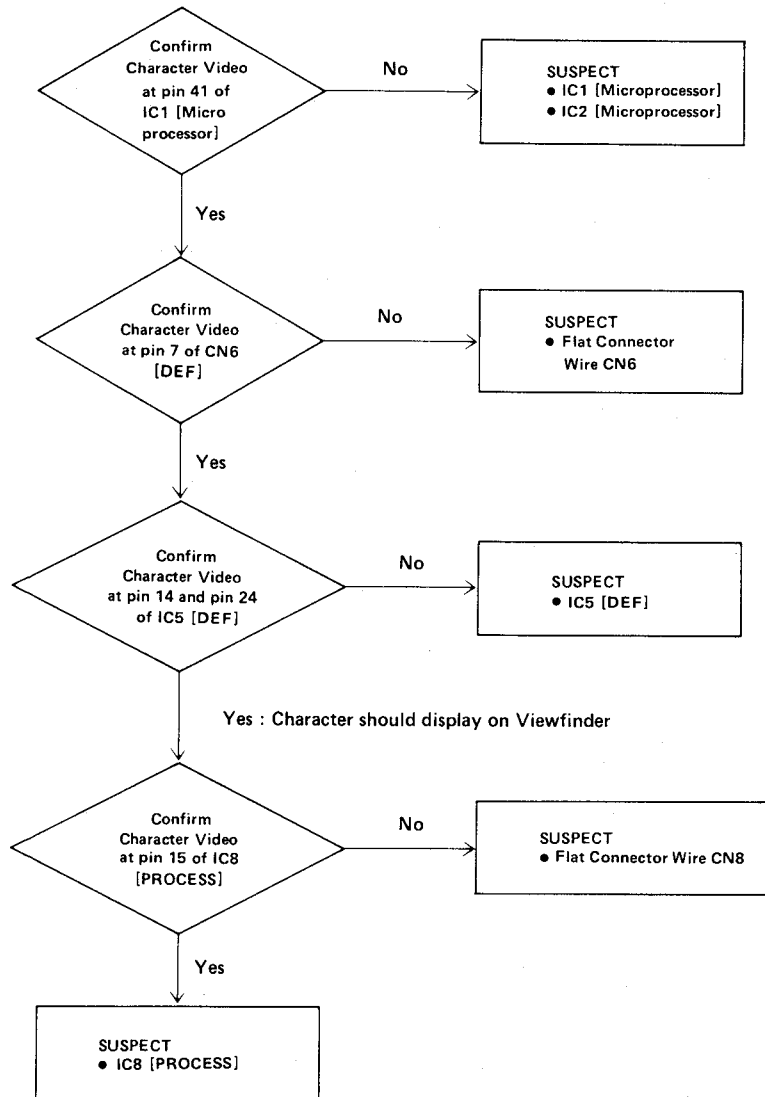
**SYMPTOM (7): Incorrect Colour
No Red or Blue Separation**



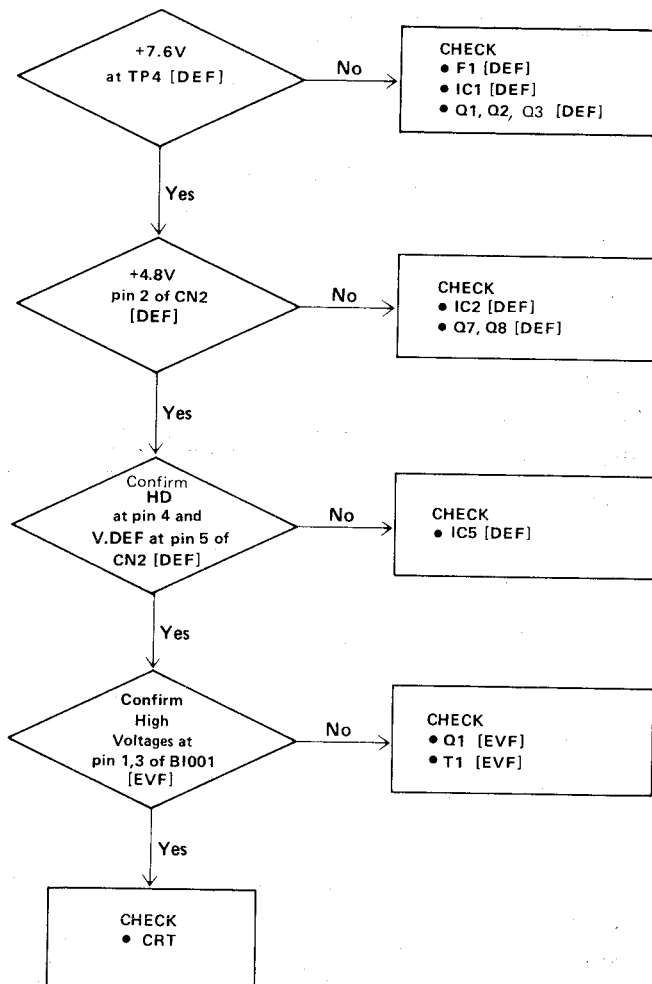
**SYMPTOM (8): Soft Picture
No Vertical or Horizontal Detail**



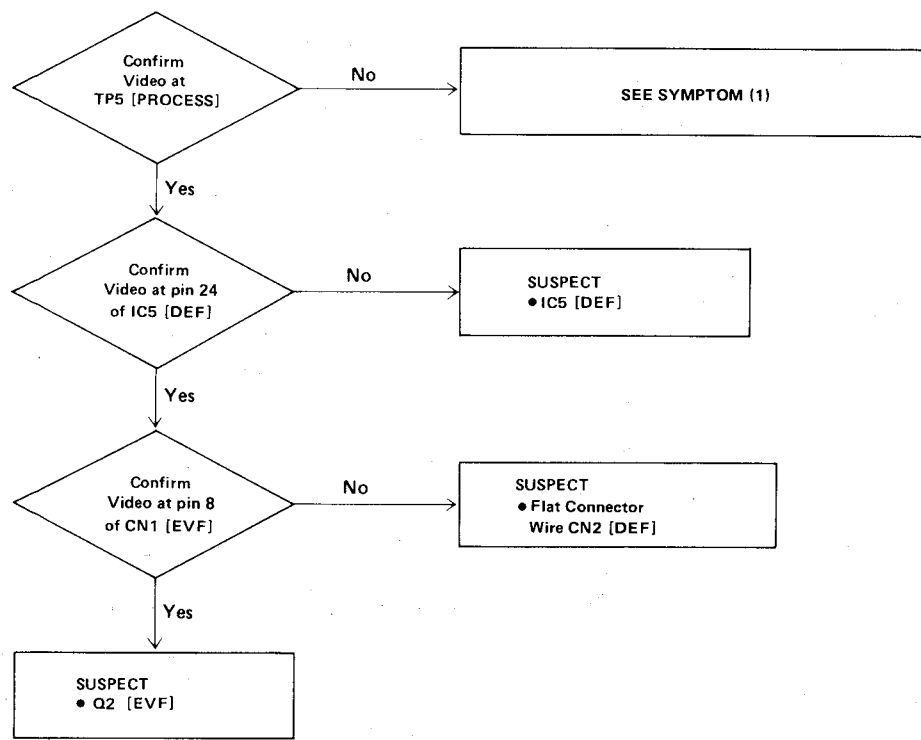
SYMPTOM (9) : No Character Display on Viewfinder or Monitor



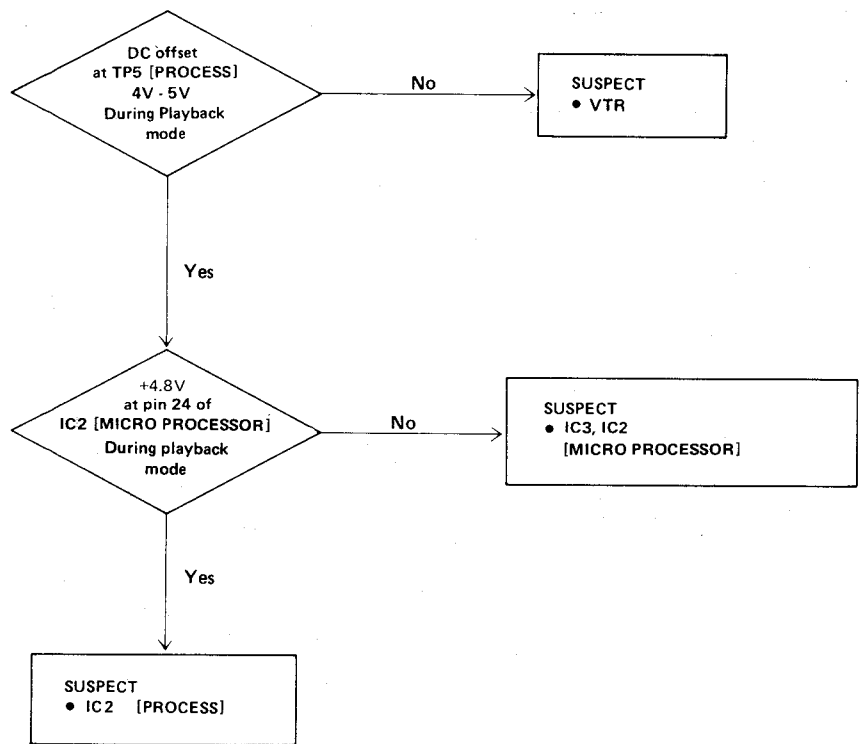
SYMPTOM (10) : No Raster on Electronic Viewfinder



SYMPTOM (11) : No Video on Electronic Viewfinder Only



SYMPTOM (12) : Two Separate Images on Electronic Viewfinder Screen During Playback Mode



7. CHIP COMPONENTS

1. Chip Transistor

The transistor number is indicated on the top surface of the chip transistor using two alphabet letters or one numerical and two alphabet letters.



Transistor Number

Letter	Transistor No.	Letter	Transistor No.
A	2SB709	X	2SD602A
B	2SB709A	Y	2SD601
C	2SB710	Z	2SD601A
D	2SB710A	1Z	2SD1030
E	2SA1022	1N	2SK199
F	2SA1034	1O	2SK198
H	2SA1035	1A	2SB799
I	2SB792	1B	2SB814
K	2SC2778	1C	2SB902
P	2SD814	1F	2SK321
Q	2SD813	1L	2SK247
R	2SC2480	1K	2SK316
S	2SC2405	1M	2SJ84
T	2SC2406	1T	2SC3077
U	2SC2404	1X	2SC2845
V	2SC2295	2B	2SK374
W	2SD602	2C	2SK116

Example

WQ → 2SD602 – Q

YQ → 2SD601 – Q

1BS → 2SB814 – S

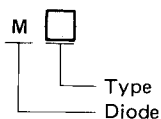
Appearance and Symbols



	1	2	3
Except 2SK199	Drain	Source	Gate
2SK199	Gate	Drain	Source

2. Chip Diode

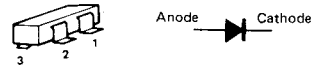
The diode number is indicated on the top surface of the chip diode using Two alphabet letters.



Diode Number

Letter	Diode No.	Letter	Diode No.
MA	MA151A	MI	MA152K
MB	MA152A	MK	MA28W-B
MC	MA153	ML	MA28T-A
MD	MA28-A	MN	MA151WA
ME	MA28-B	MO	MA152WA
MF	MA28W-A	MT	MA151WK
MH	MA151K	MU	MA152WK

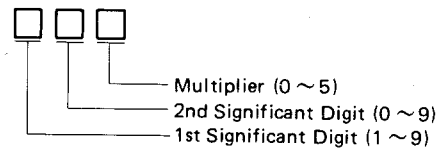
Appearance and Symbols



	1	2	3
MA28/28W/28T	—	Anode	Cathode
MA151K/152K	—	Anode	Cathode
MA151A/152A	—	Cathode	Anode
MA151WK/MA152WK	Anode	Anode	Cathode
MA151WA/MA152WA	Cathode	Cathode	Anode
MA153	Cathode	Anode	Common

2. Chip Resistor

The resistor value is indicated on the bottom surface of the chip resistor using three digit numbers.



EXAMPLE:

330 → $33 \times 10^0 = 33 \text{ ohms}$

561 → $56 \times 10^1 = 560 \text{ ohms}$

123 → $12 \times 10^3 = 12 \text{ kohms}$

Note: Zero ohm resistor (jumper chip) is colored red or green.

3. Chip Capacitor

The capacitive value of replacement chip capacitors is indicated on the bottom surface. Original parts do not have value indication.

If the capacitive value is less than 100 pF, the value will be indicated by one or two digit number expressing the capacity directly in pF.

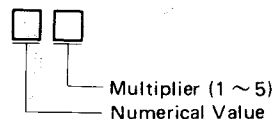
EXAMPLE:

0.5 → 0.5 pF 2.5 → 2.5 pF

.75 → 0.75 pF 33 → 33 pF

1 → 1 pF 82 → 82 pF

If the capacitive value is 100 pF or greater, the value will be indicated by an alpha-numeric code. The letter precedes the number and expresses a numerical value to be multiplied by the number which follows.



Numerical Value

Letter	Value	Letter	Value
A	10	N	33
B	11	P	36
C	12	Q	39
D	13	R	43
E	15	S	47
F	16	T	51
G	18	U	56
H	20	V	62
J	22	W	68
K	24	X	75
L	27	Y	82
M	30	Z	91

* Letters I and O are not used.

EXAMPLE:

$$A1 \longrightarrow 10 \times 10^1 = 100 \text{ pF}$$

$$N2 \longrightarrow 33 \times 10^2 = 3300 \text{ pF}$$

$$S3 \longrightarrow 47 \times 10^3 = 47000 \text{ pF}$$

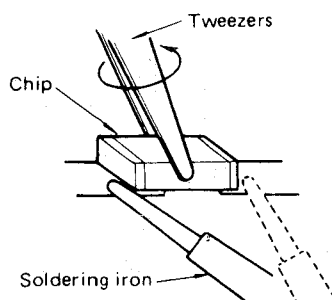
4. Precautions in replacing the chip component

1. Make sure that the unit is turned OFF when replacing the chip.
2. Use tweezers to prevent any damage to the chip surface.
3. Do not re-use the chips after removal.
4. Do not rub the electrode of chips.
5. Do not subject the chips to excessive stress.
6. It is recommended that a pencil-type soldering iron to be used.
7. The solder whose diameter is less than 0.5 mm is recommended.
8. Do not heat the chip beyond 3 seconds.
9. Maintain temperature control under 260°C (500°F) when soldering.

4-1 Removal (Transistor, Diode, Resistor and Capacitor)

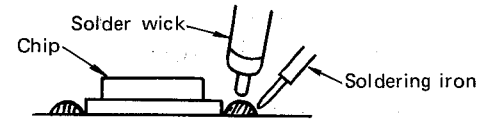
1. Add the solder to both ends of the chip (three leads for chip transistor).
2. While attaching the soldering iron to both ends of the chip (three leads for chip transistor) as shown below, remove the chip by turning it with tweezers.

Note: Be careful not to damage other chips.

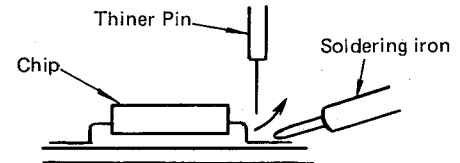


4-2 Removal (IC)

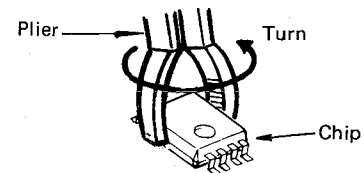
1. Add the solder wick and solder iron to each lead of the IC and remove solder.



2. Add the solder iron to each lead of the IC and left each lead of the IC using thinner pin.

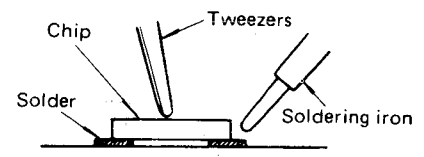


3. Remove IC turning it with plier.

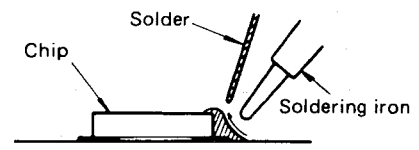


4-3 Mounting

1. Place the solder thinly on the chip mounting foil.
2. Solder the chip temporarily while holding the chip with the tweezers.



3. Solder both ends of chip (three leads for chip transistor).



Service Manual

Vol. 3

Block Diagrams
Schematic Diagrams
Conductor Views

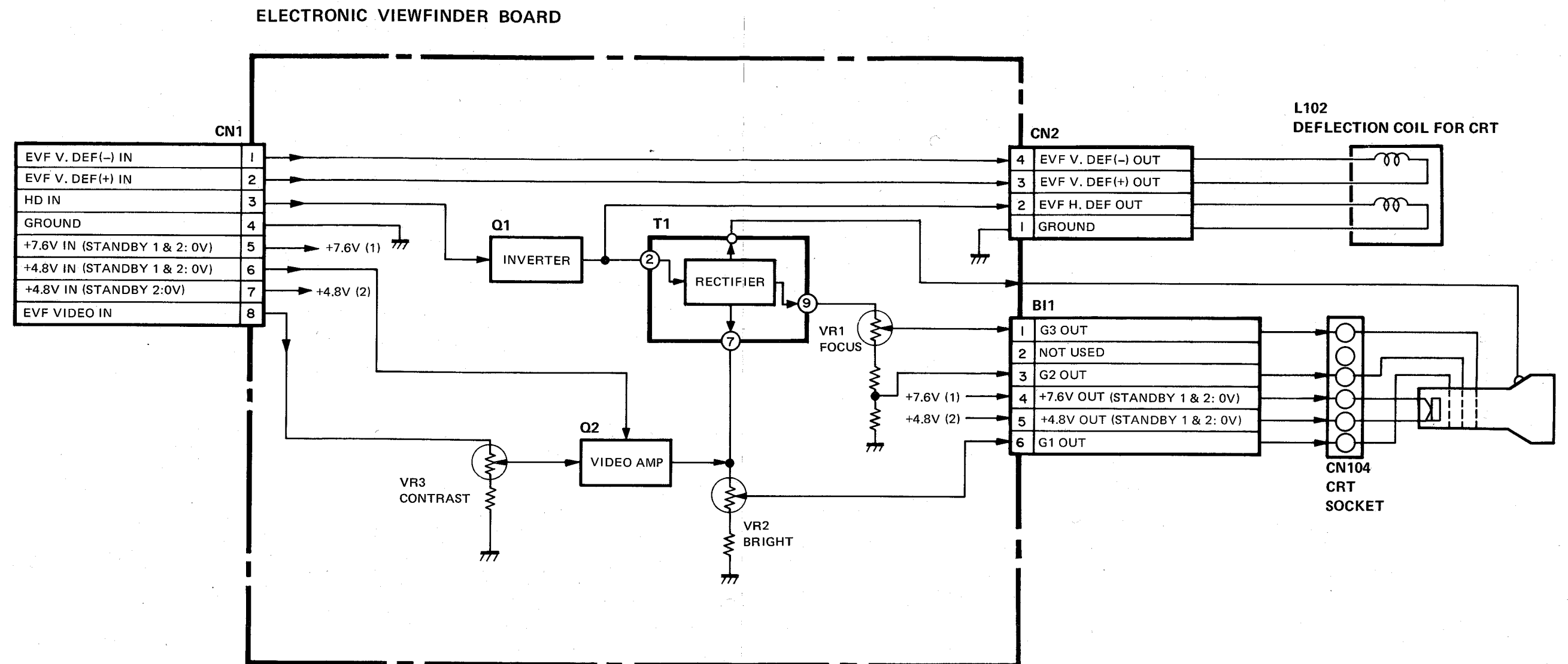
Colour Video Cameras

WVP-G1E/WVP-G1N

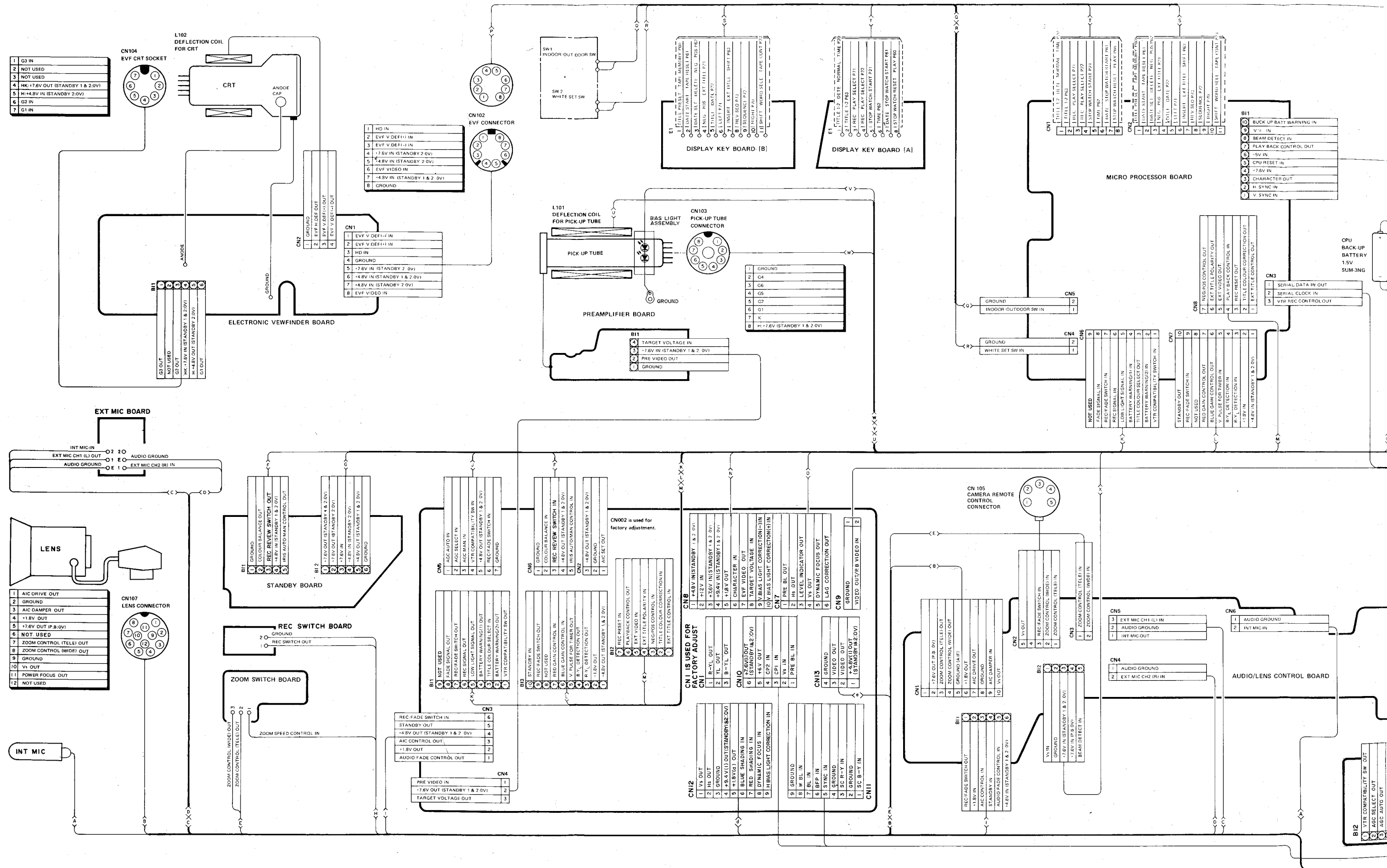
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Process Board	6~8
Deflection Board	9~11
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Microprocessor Board	15~17
Sync-1 Board/Sync-2 Board	18~20
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Camera Remote Control Board	62~65

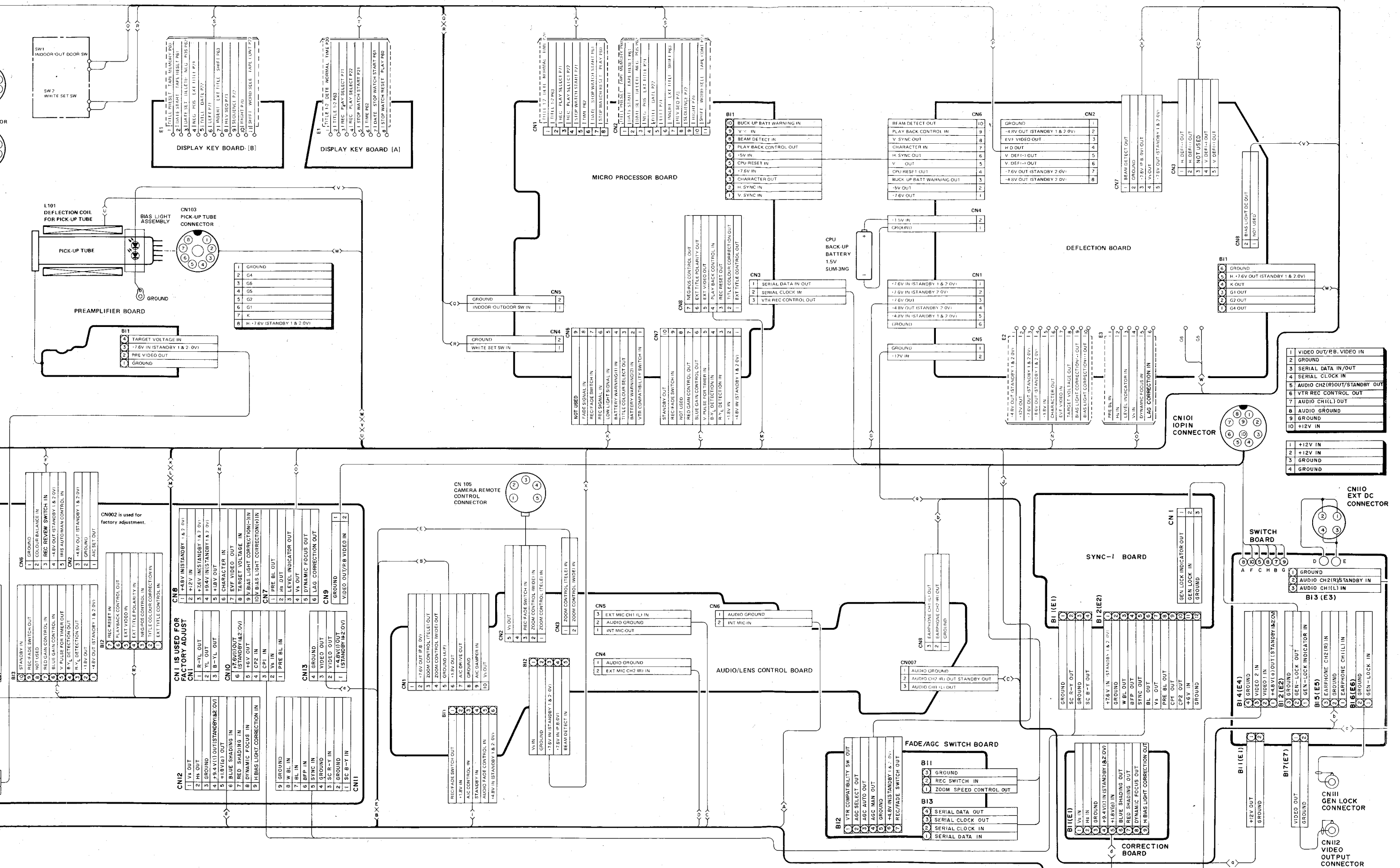
BLOCK DIAGRAM OF ELECTRONIC VIEWFINDER BOARD



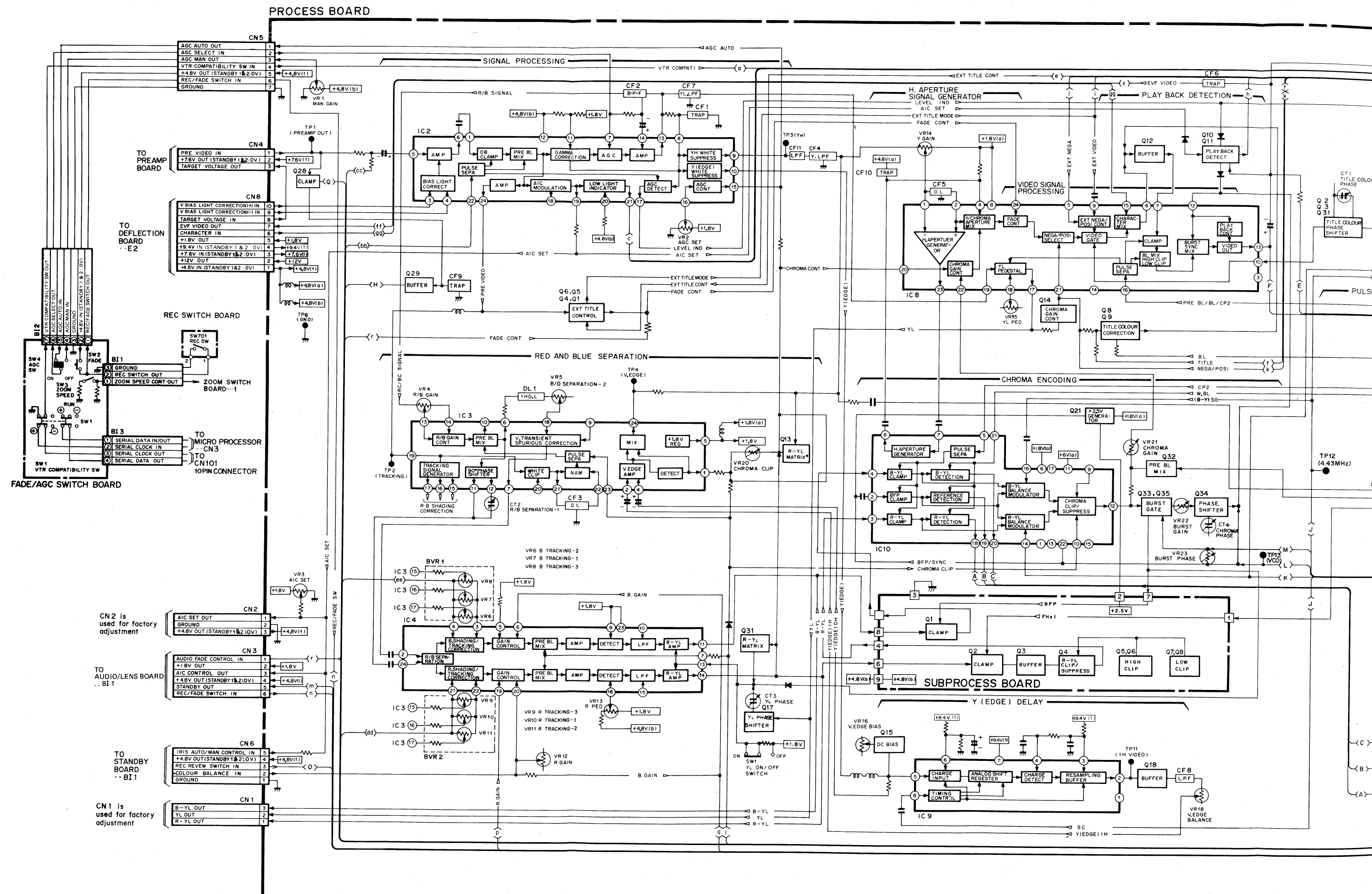
WIRING DIAGRAM



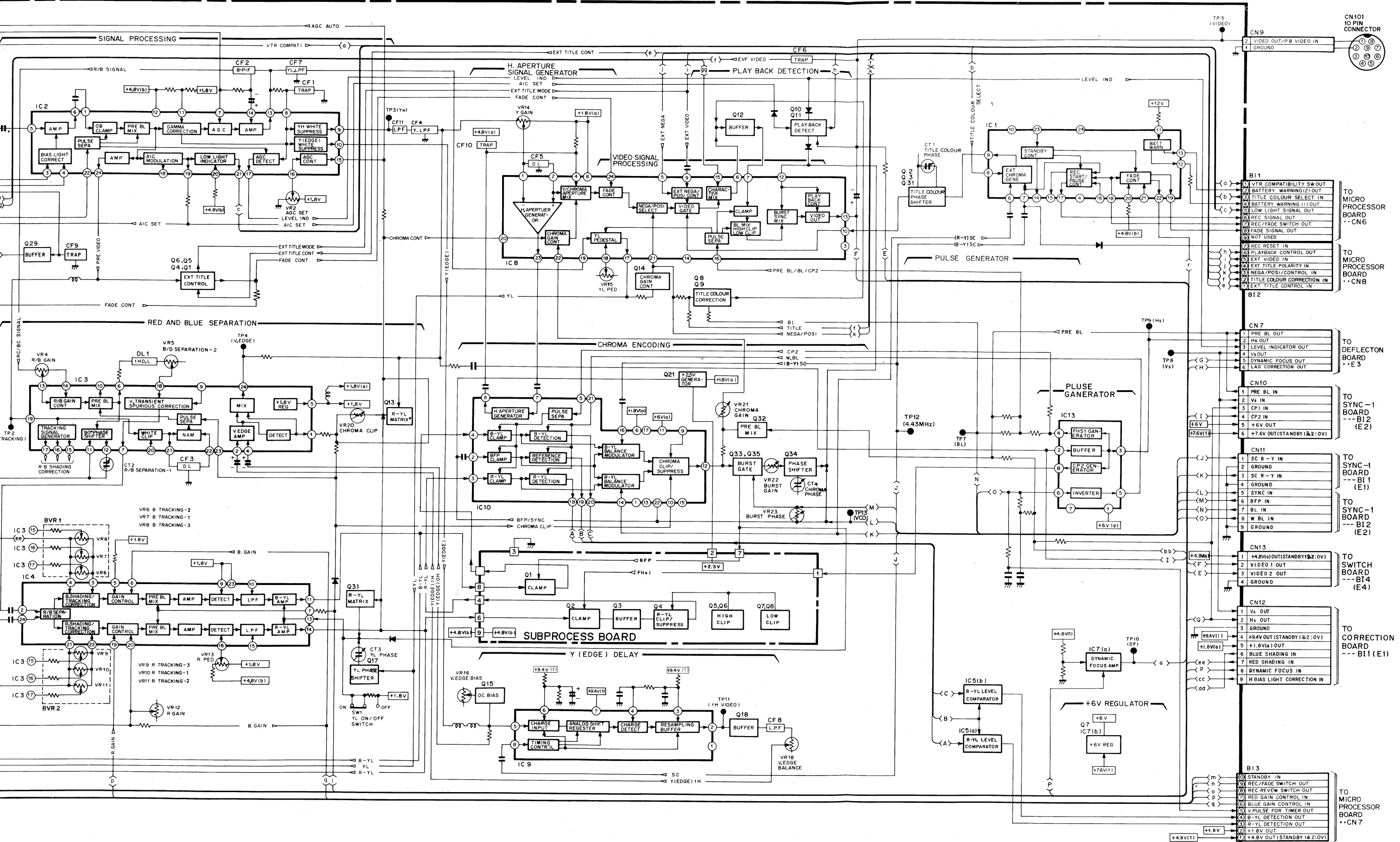
WIRING DIAGRAM



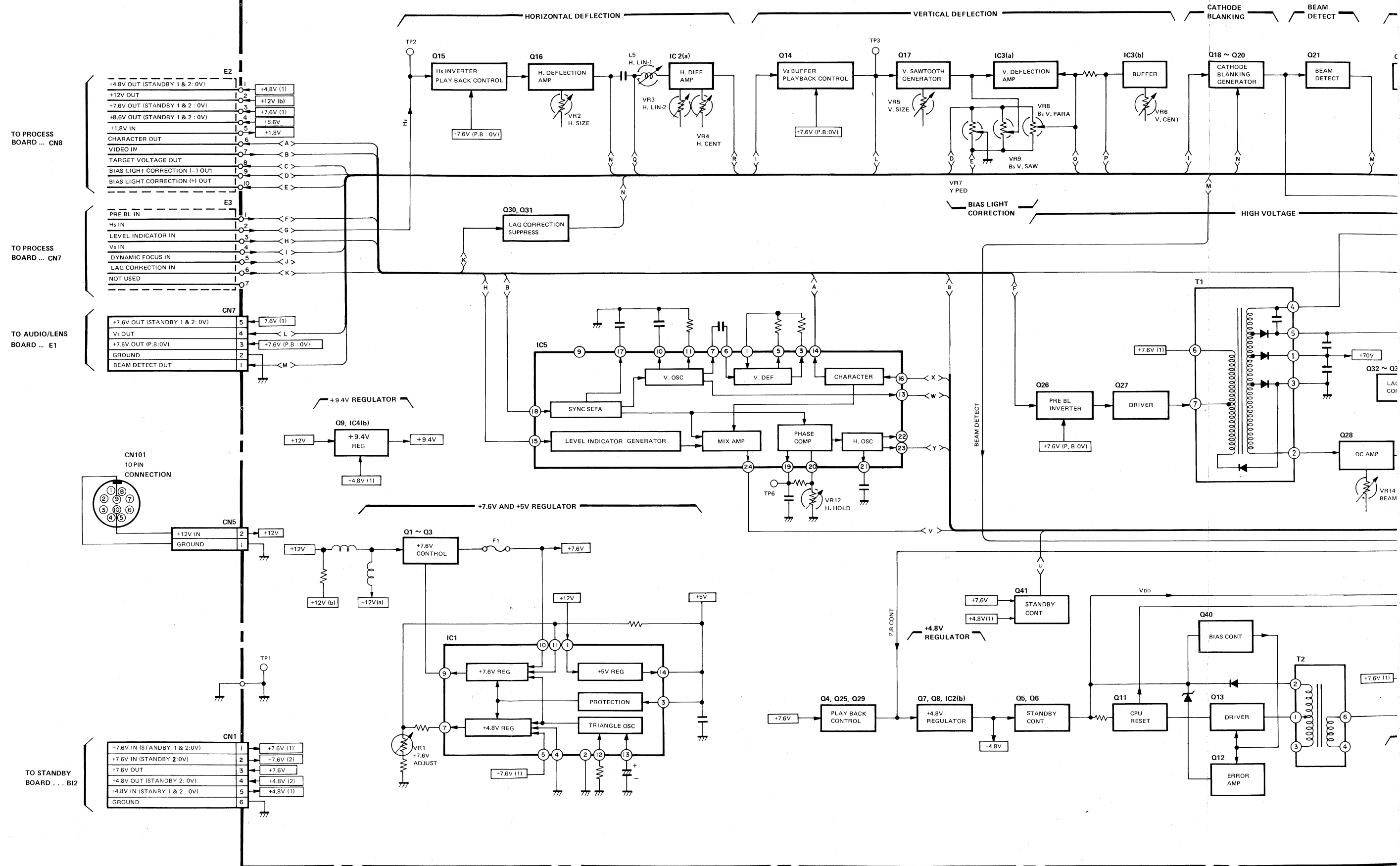
BLOCK DIAGRAM OF PROCESS BOARD



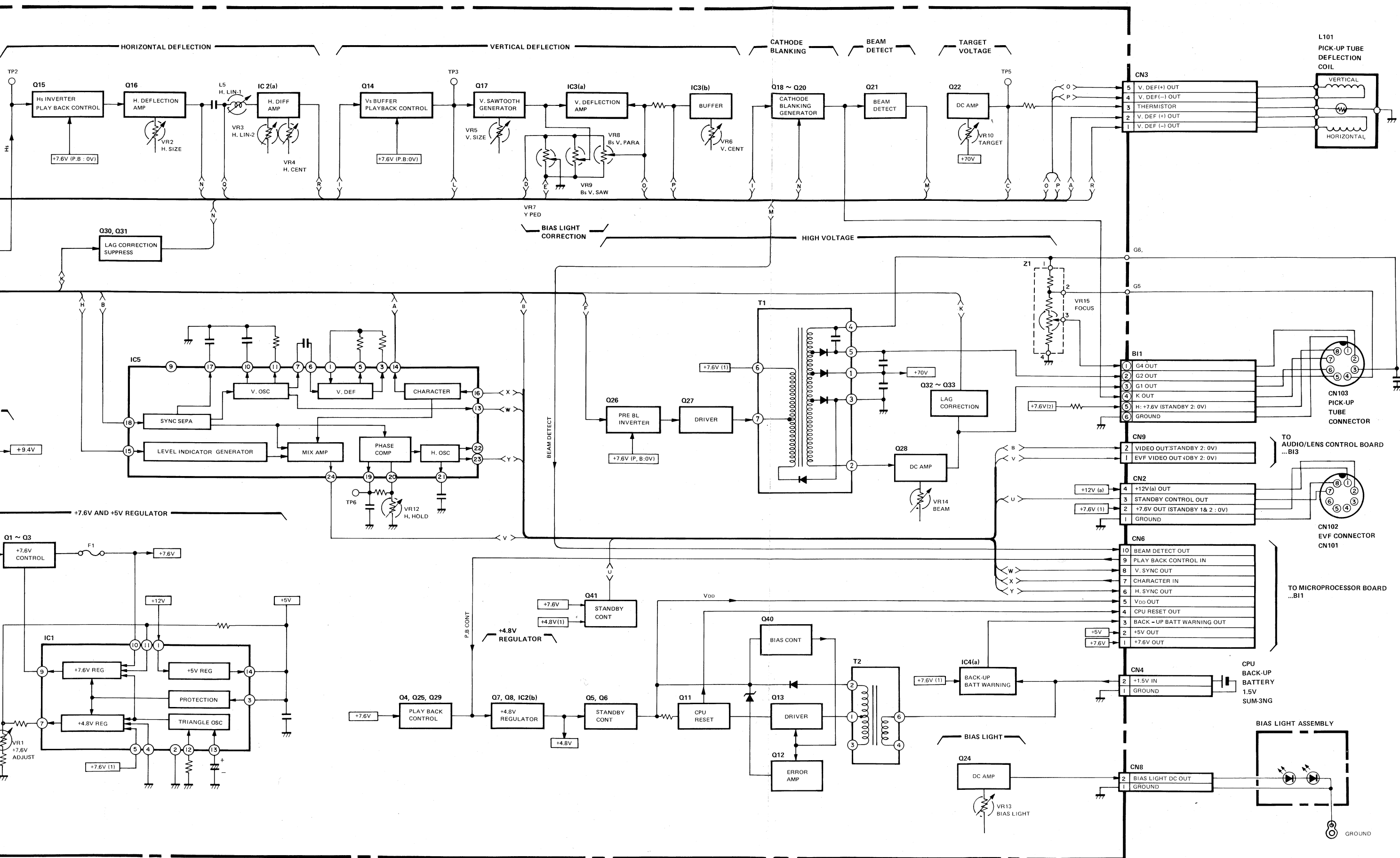
BLOCK DIAGRAM OF PROCESS BOARD



DEFLECTION BOARD

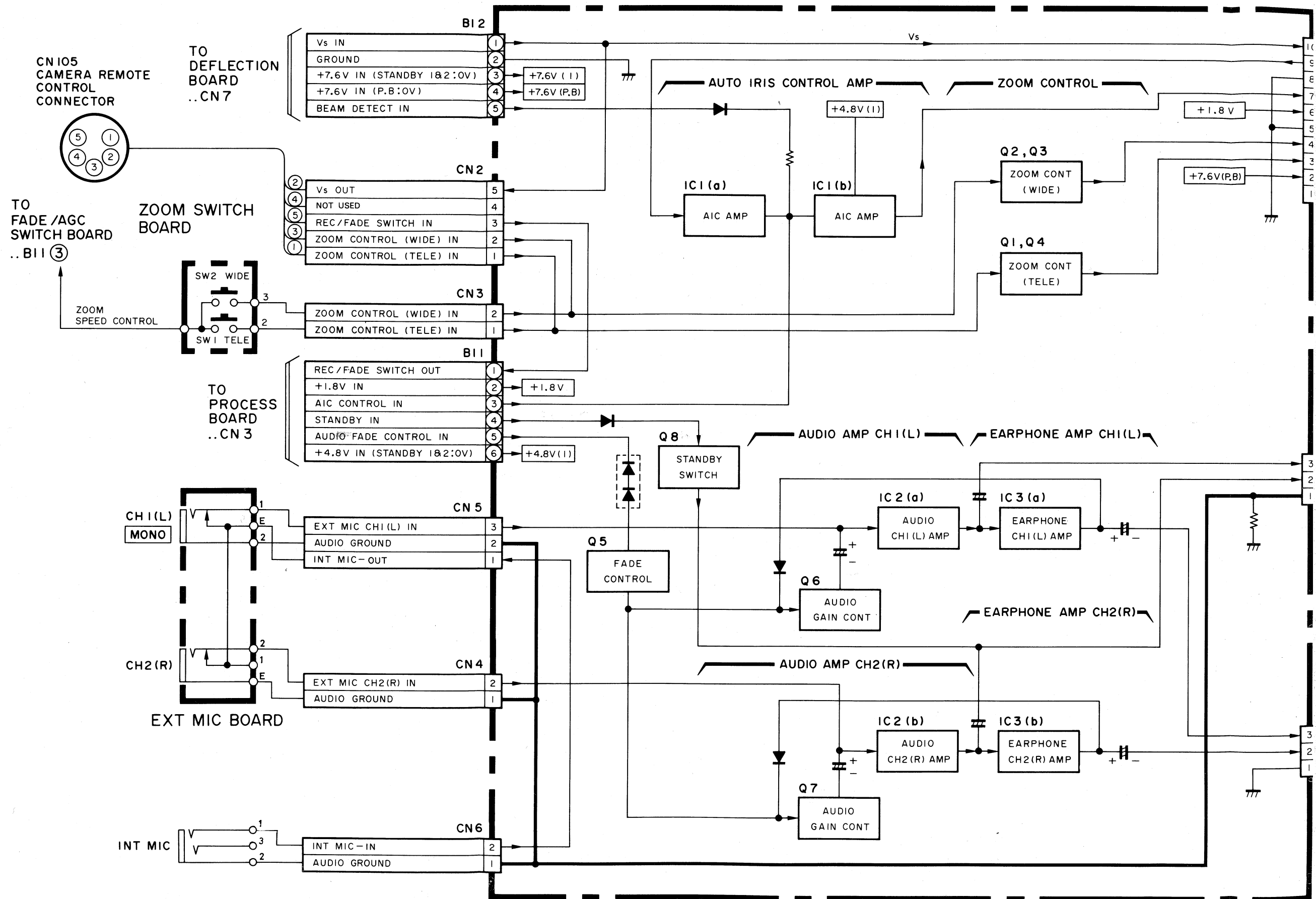


BLOCK DIAGRAM OF DEFLECTION BOARD



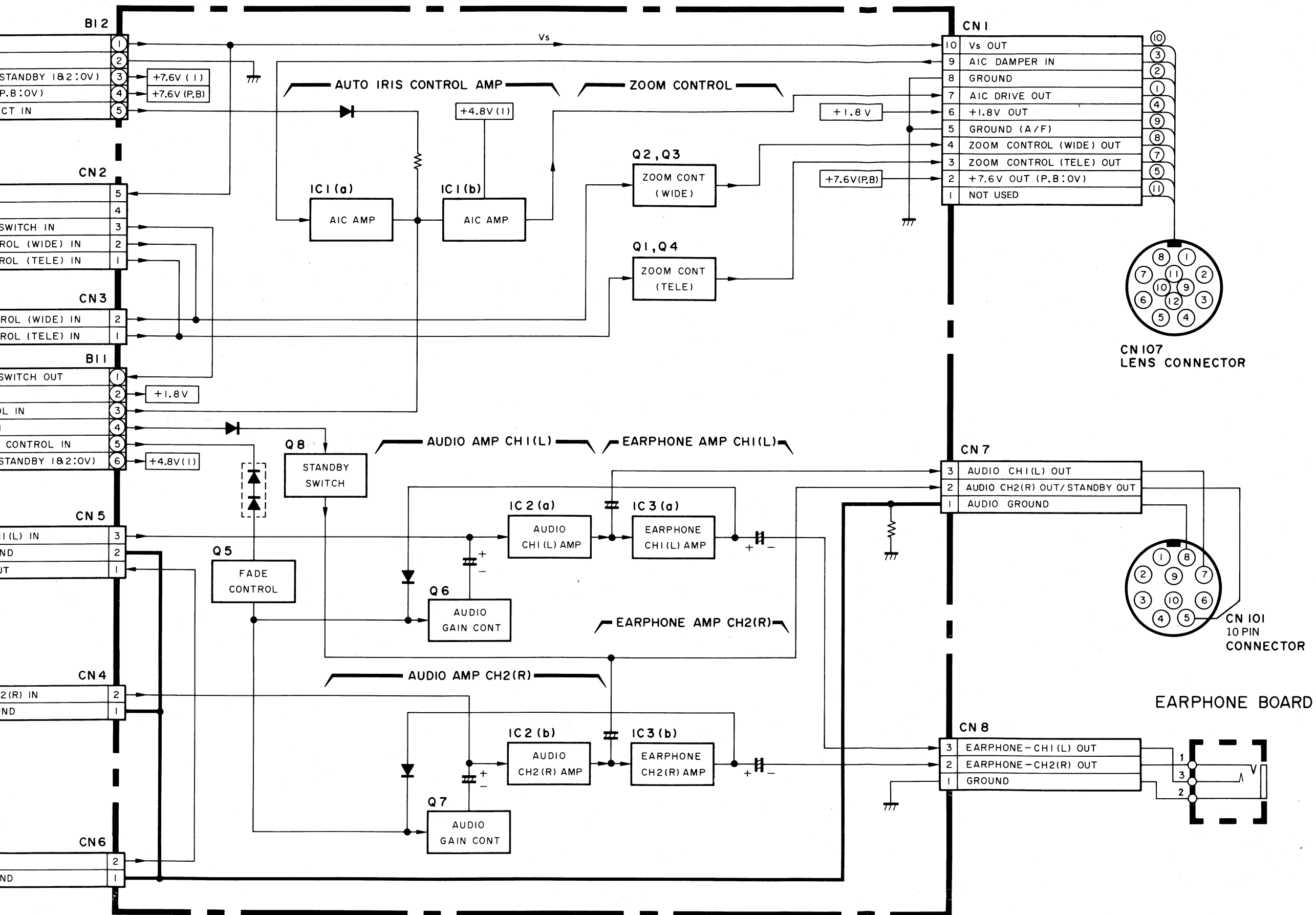
BLOCK DIAGRAM OF AUDIO/LENS CONTROL BOARD

AUDIO / LENS CONTROL BOARD



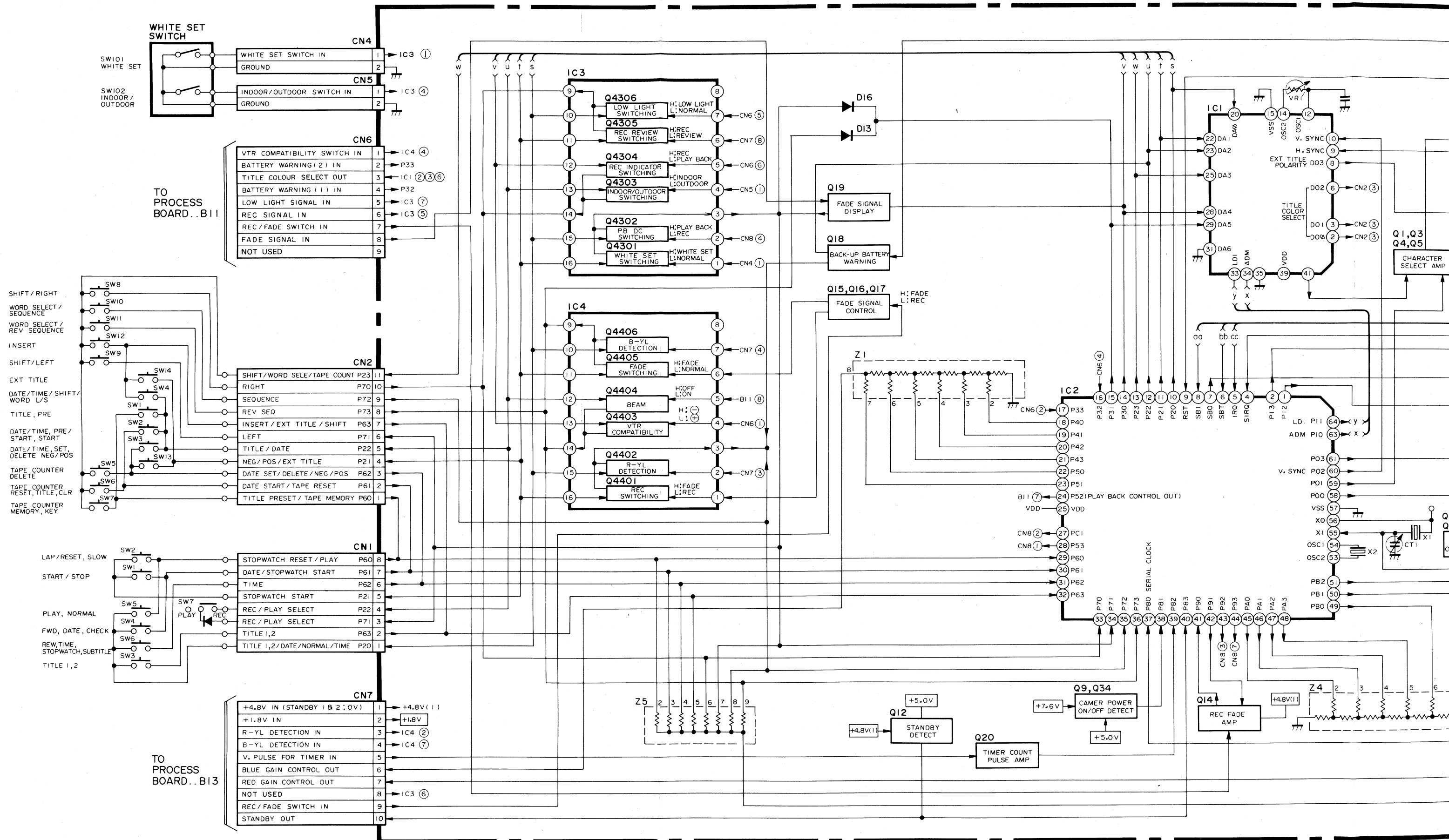
BLOCK DIAGRAM OF AUDIO/LENS CONTROL BOARD

AUDIO / LENS CONTROL BOARD



BLOCK DIAGRAM OF MICROPROCESSOR BOARD

MICRO PROCESSOR BOARD



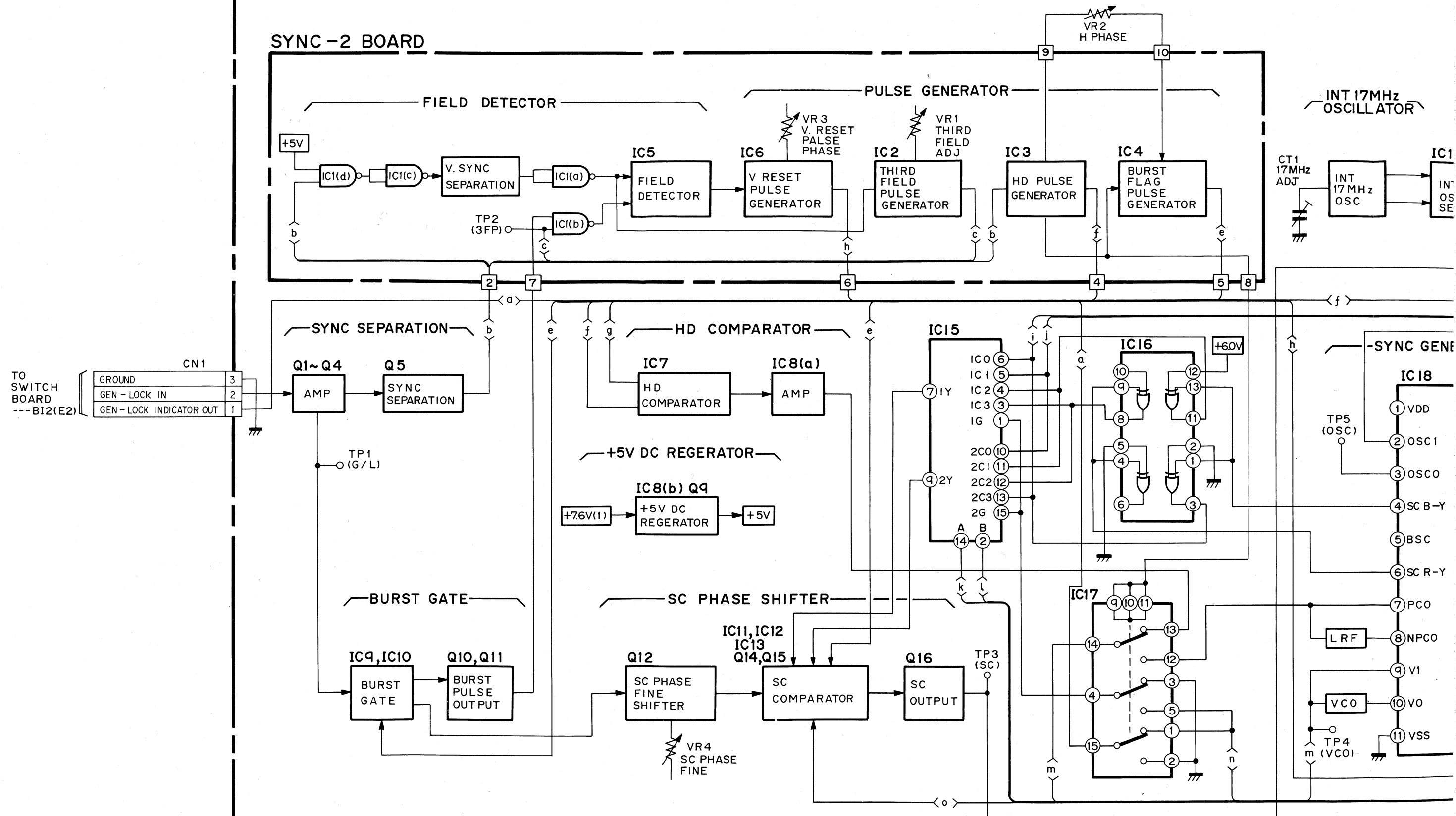
The diagram illustrates the control logic of a VCR, centered around microprocessor IC2. Key components and their functions include:

- Microprocessor (IC2):** The central control unit with multiple pins for data, address, and control signals.
- Decoders (IC1, IC3, IC4):** IC1 handles video input signals (DA1-DA6). IC3 and IC4 manage playback controls and character select functions.
- Buffers and Inverters:** Q31 (V.SYNC BUFFER), Q32 (RESET PULSE INVERTOR), Q33 (H.SYNC INVERTOR), and Q34 (CAMER POWER ON/OFF DETECT) condition and invert signals.
- Power and Timing:** Q2, Q30 (POWER CONTROL), Q10, Q11 (TIMER COUNTER SELECT), and Q12 (STANDBY DETECT) manage power states and timing pulses.
- Interfacing:** Connectors B11, CN8, and CN3 interface the VCR with the deflection board, process board, and a 10-pin connector respectively.
- Other Components:** Z1 (resistor network), Z4 (resistor network), and various diodes (D13, D16) are used for signal conditioning and protection.

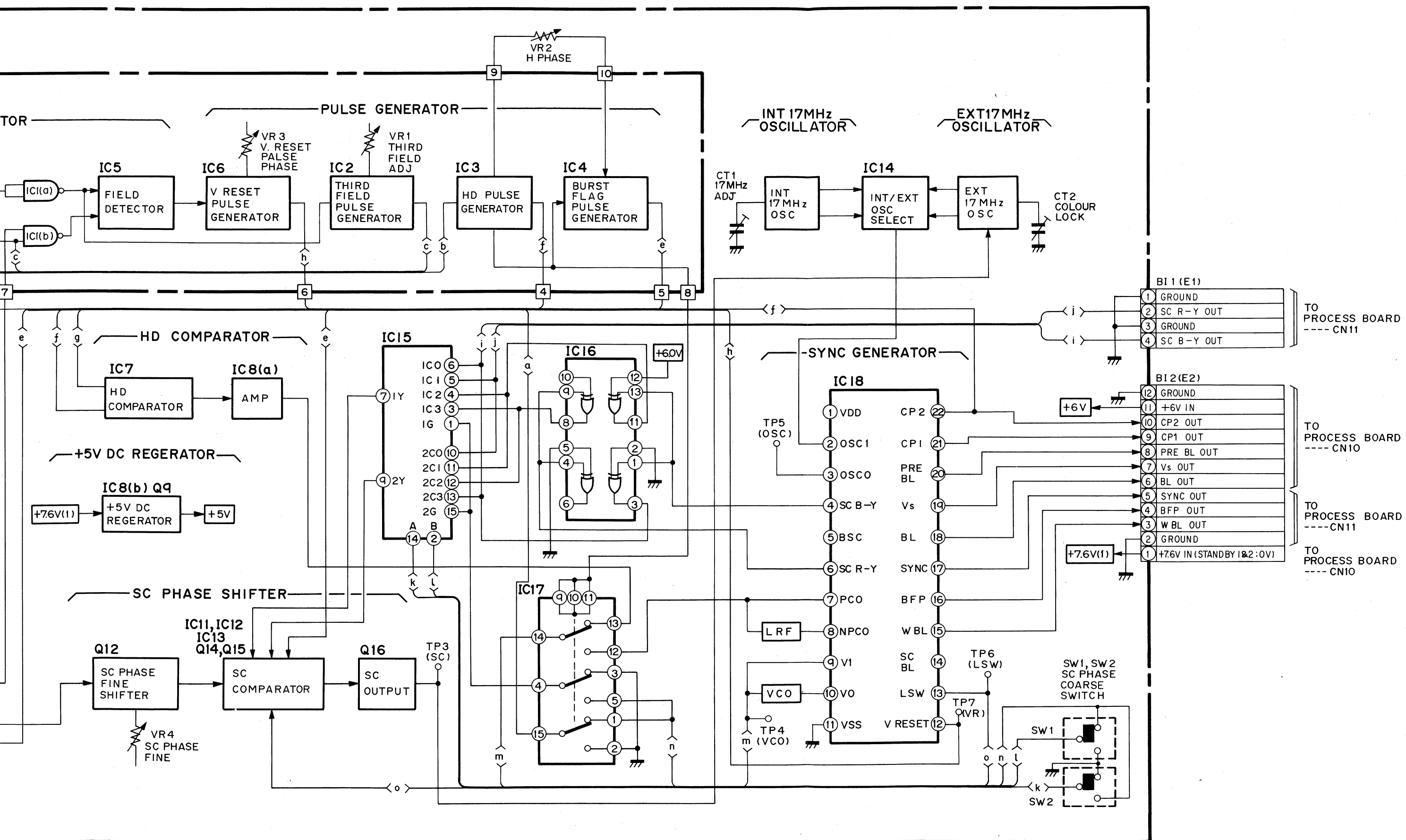
BLOCK DIAGRAM OF SYNC-1 BOARD/SYNC-2 BOARD

SYNC-1 BOARD

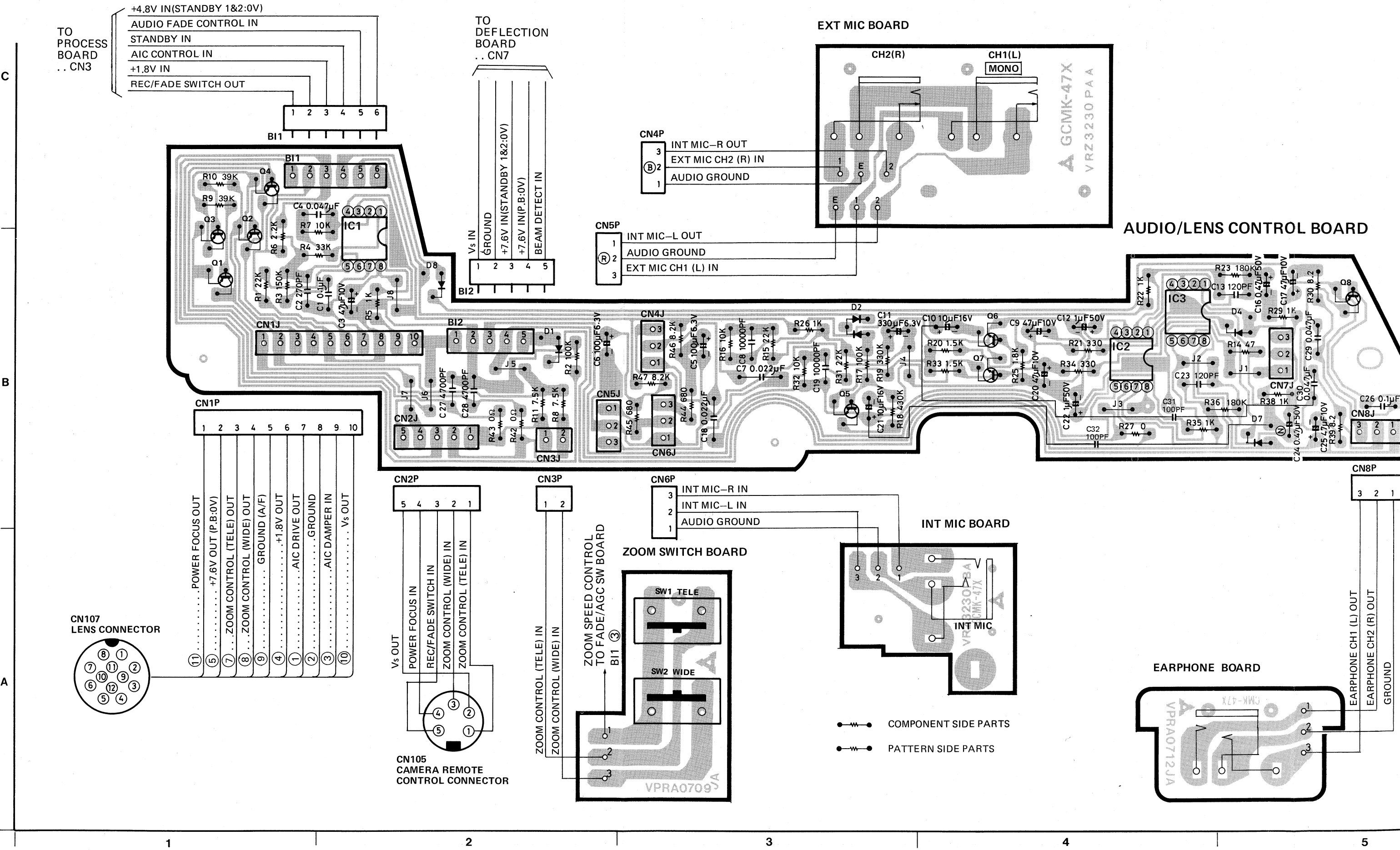
SYNC-2 BOARD



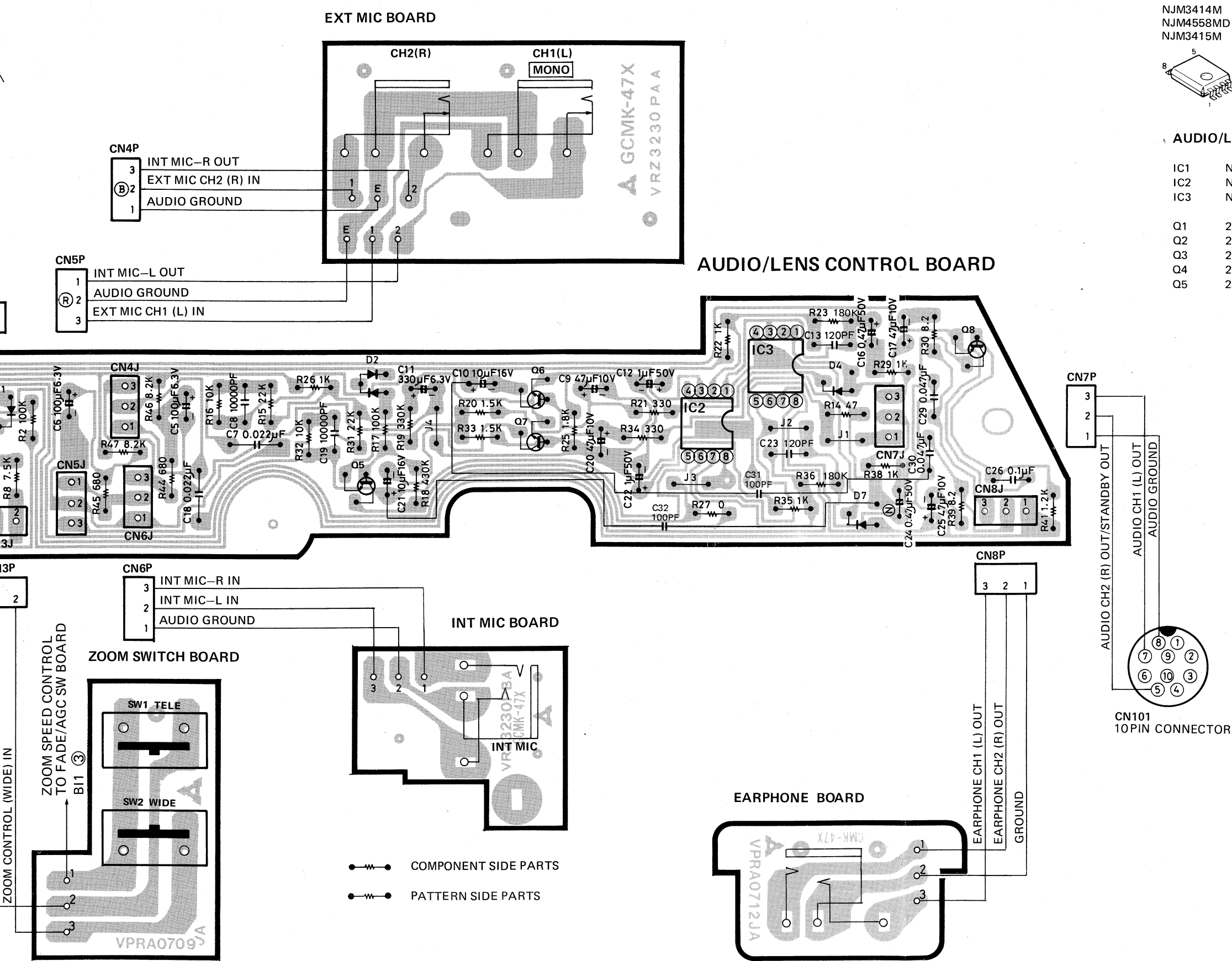
BLOCK DIAGRAM OF SYNC-1 BOARD/SYNC-2 BOARD



CONDUCTOR VIEW OF AUDIO/LENS CONTROL BOARD



CONDUCTOR VIEW OF AUDIO/LENS CONTROL BOARD



NJM3414M
NJM4558MD
NJM3415M

2SC2405-STU
2SB709-QRS

MA151K

MA153

1 : NC
2 : Anode
3 : Cathode

AUDIO/LENS CONTROL BOARD

IC1 NJM3414M
IC2 NJM4558MD
IC3 NJM3415M

B2
B4
B4

Q6 2SC2405STU [S]
Q7 2SC2405STU [S]
Q8 2SB709-QRS [A]

B4
B4
B5

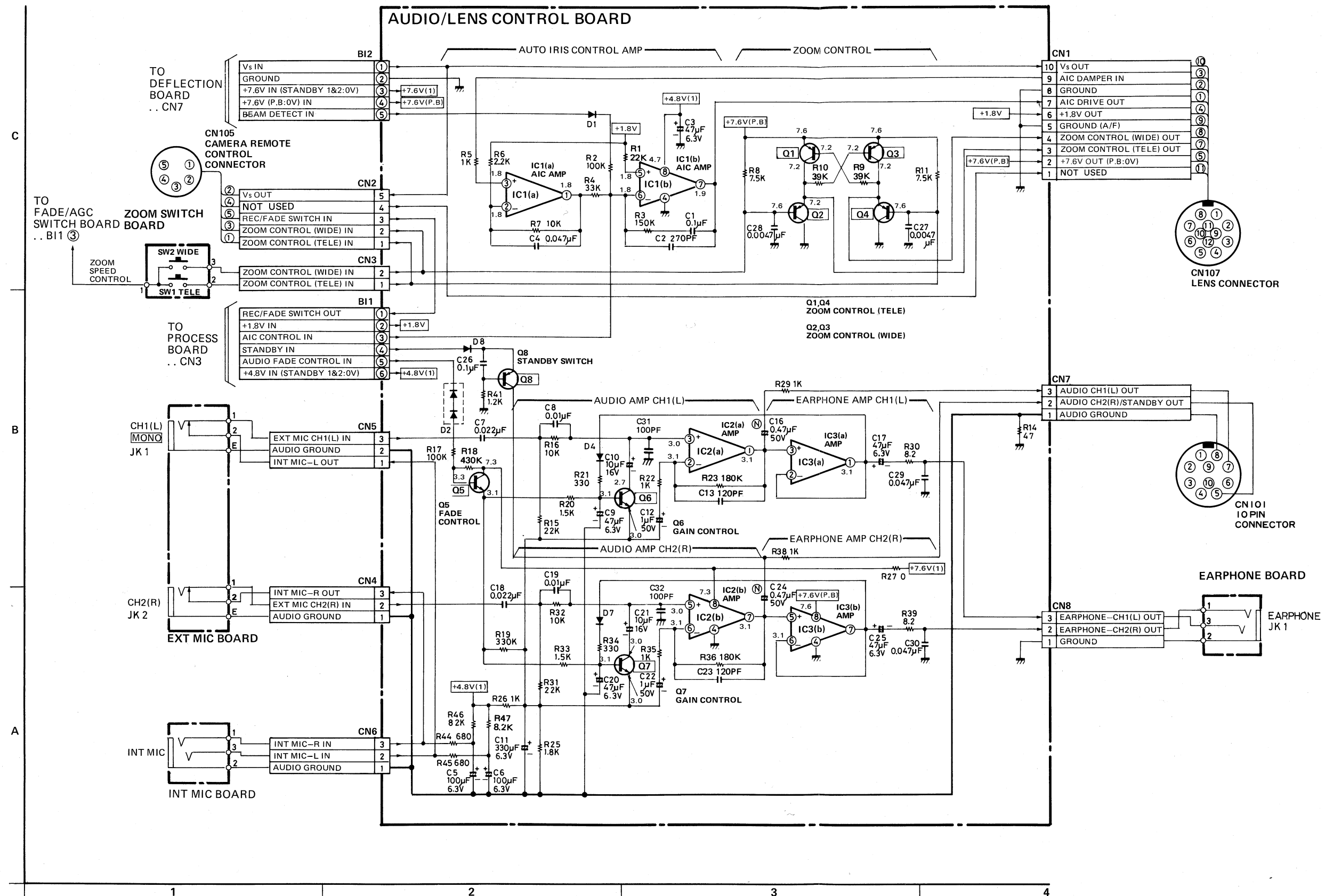
Q1 2SB709-QRS [A]
Q2 2SB709-QRS [A]
Q3 2SB709-QRS [A]
Q4 2SB709-QRS [A]
Q5 2SC2405ST [S]

B1
B1
B1
C1
B3

D1 MA151K [MH]
D2 MA153 [MC]
D4 MA151K [MH]
D7 MA151K [MH]
D8 MA151K [MH]

B2
B3
B5
B5
B2

SCHEMATIC DIAGRAM OF AUDIO/LENS CONTROL BOARD

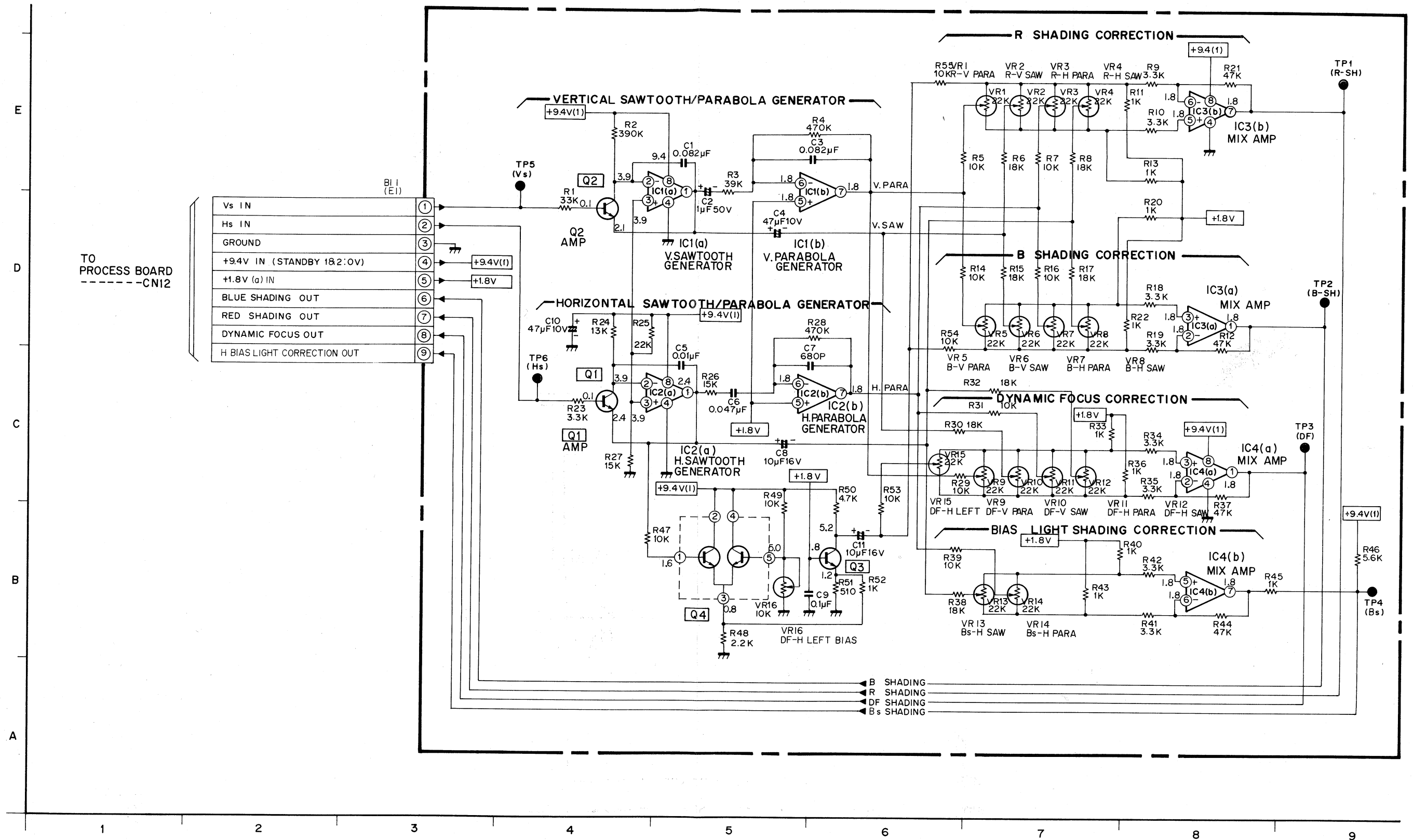


AUDIO/LENS CONTROL BOARD

IC1	NJM3414M		C2,C3
IC2	NJM4558MD		A3,B3
IC3	NJM3415M		A3,B3
Q1	2SB709-QRS	[A]	C3
Q2	2SB709-QRS	[A]	C3
Q3	2SB709-QRS	[A]	C3
Q4	2SB709-QRS	[A]	C3
Q5	2SC2405ST	[S]	B2
Q6	2SC2405STU	[S]	B3
Q7	2SC2405STU	[S]	A3
Q8	2SB709-QRS	[A]	B2
D1	MA151K	[MH]	C2
D2	MA151	[MC]	B2
D4	MA151K	[MH]	B2
D7	MA151K	[MH]	A2
D8	MA151K	[MH]	B2

SCHEMATIC DIAGRAM OF CORRECTION BOARD

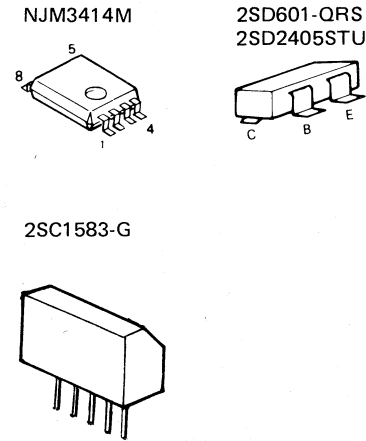
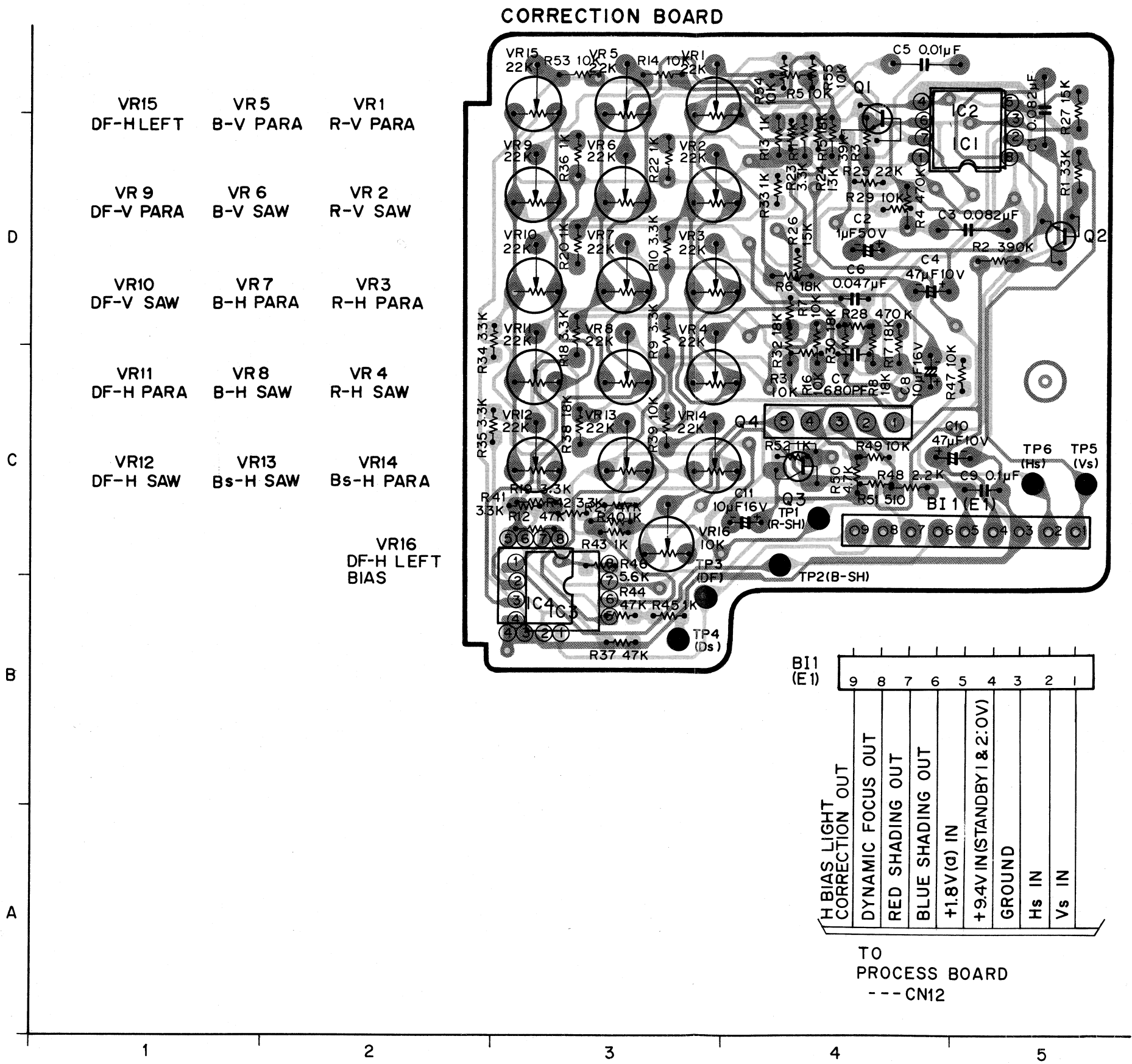
CORRECTION BOARD



CORRECTION BOARD

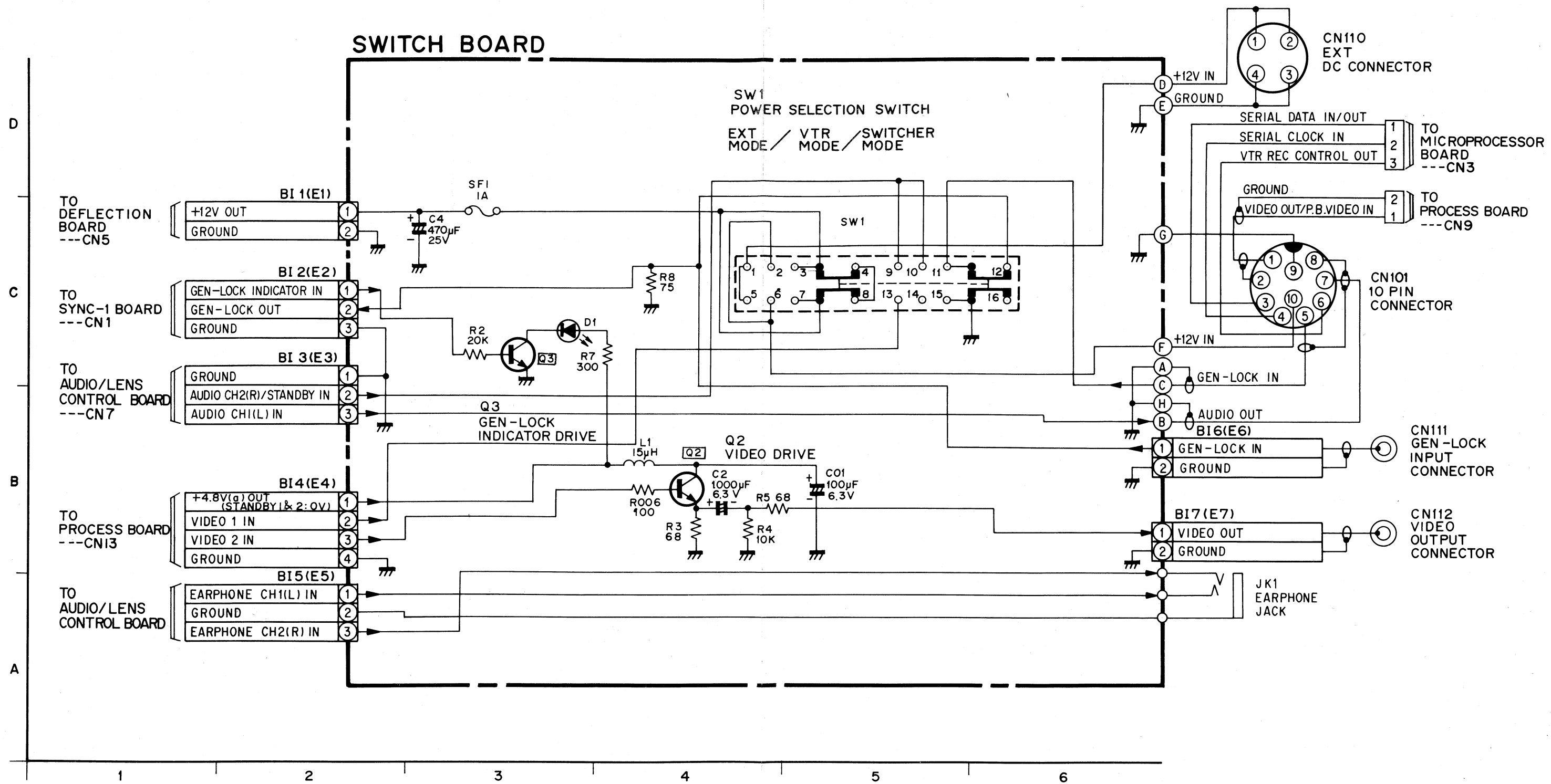
IC1	NJM3414M	D5, D6	Q1	2SD601-QRS	(Y)	C4
IC2	NJM3414M	C5, C6	Q2	2SC2405STU	(S)	D4
IC3	NJM3414M	D8, E8	Q3	2SD601-QRS	(Y)	B6
IC4	NJM3414M	C8, B8	Q4	2SC1583-G		B5

CONDUCTOR VIEW OF CORRECTION BOARD



CORRECTION BOARD			
IC1	NJM3414M		D5
IC2	NJM3414M		D5
IC3	NJM3414M		B5
IC4	NJM3414M		B3
Q1	2SD601-QRS	(Y)	D4
Q2	2SC2405STU	(S)	D5
Q3	2SD601-QRS	(Y)	C4
Q4	2SC1583-G		C4

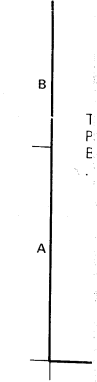
SCHEMATIC DIAGRAM OF SWITCH BOARD



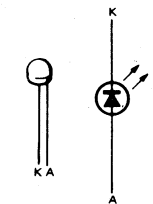
SWITCH BOARD

Q2	2SD638-QRS	C3
Q3	2SD636-QRS	B4
D1	GL-3HY7H	C3

CC



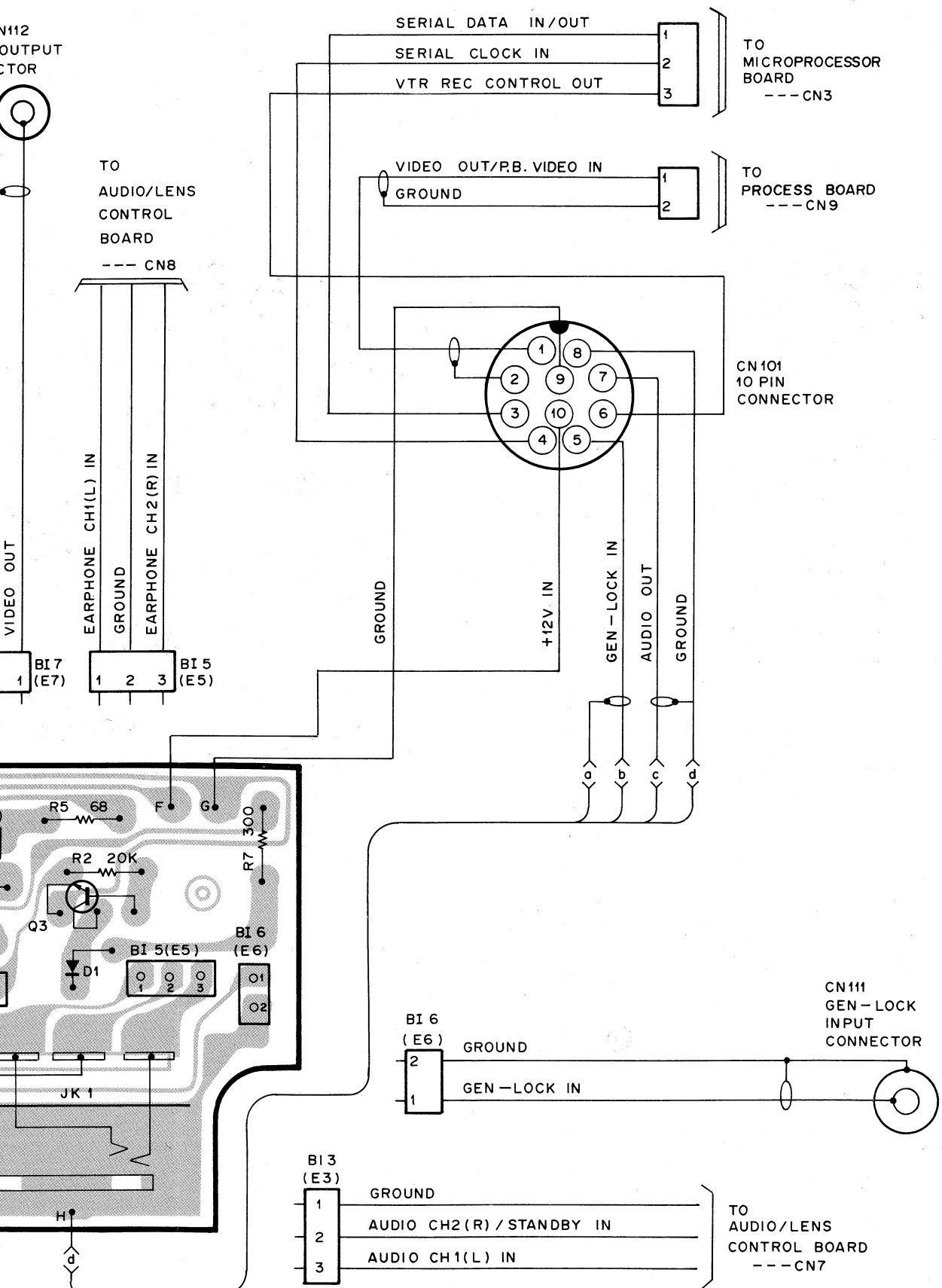
GL-3HY7H



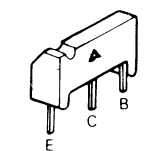
SCHI

B3
B4
B4

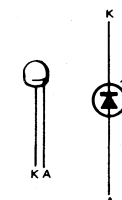
VIEW OF SWITCH BOARD



2SD638-QRS
2SD636-QRS



GL-3HY7H



SWITCH BOARD

Q2 2SD638-QRS
Q3 2SD636-QRS
D1 GL-3HY7H

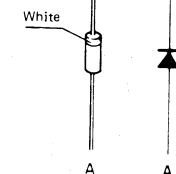
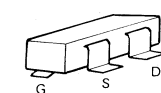
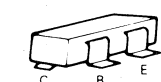
B3
B4
B4

PREAMPLIFIER BOARD

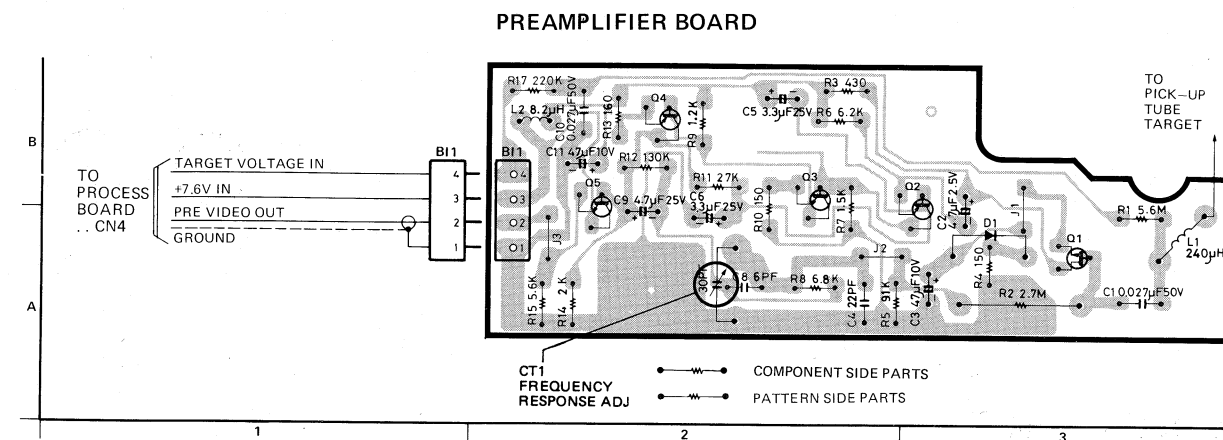
Q1 2SK316-PQ [1K] A3
Q2 2SA1022-CD [E] B3
Q3 2SC2404-CD [U] B2
Q4 2SA1022-CD [E] B2
Q5 2SD601-QRS [Y] B5
D1 MA165 A3

2SA1022-CD
2SC2404-CD
2SD601-QRS

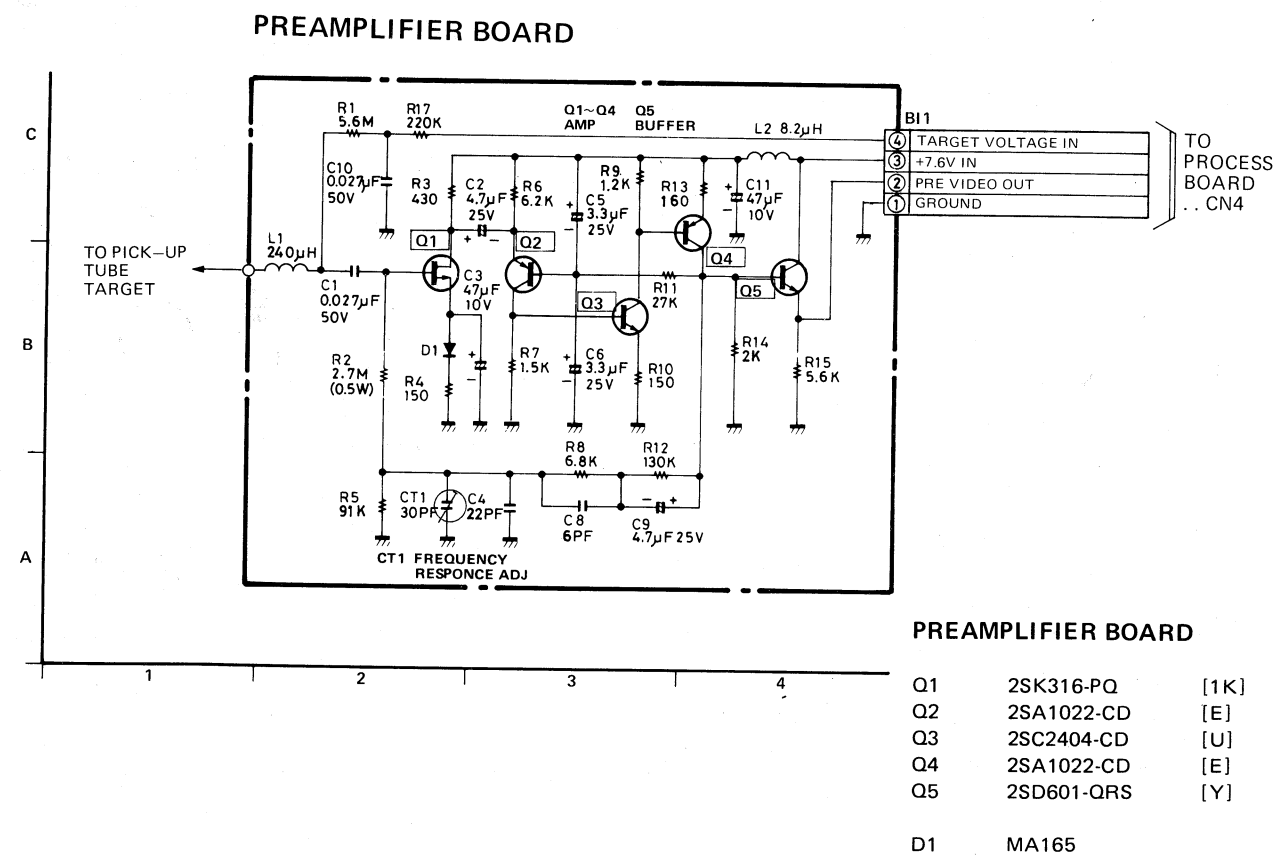
2SK316-P



CONDUCTOR VIEW OF PREAMPLIFIER BOARD



SCHEMATIC DIAGRAM OF PREAMPLIFIER BOARD



PREAMPLIFIER BOARD

Q1 2SK316-PQ [1K] B2
Q2 2SA1022-CD [E] B3
Q3 2SC2404-CD [U] B3
Q4 2SA1022-CD [E] C4
Q5 2SD601-QRS [Y] B4
D1 MA165 B2

CONDUCTOR VIEW OF SYNC-1 BOARD/SYNC-2 BOARD

CN1P

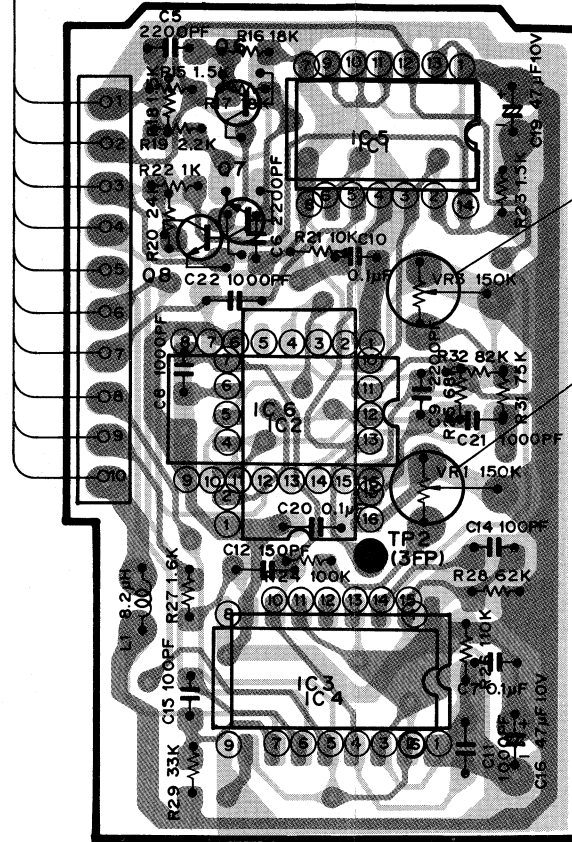
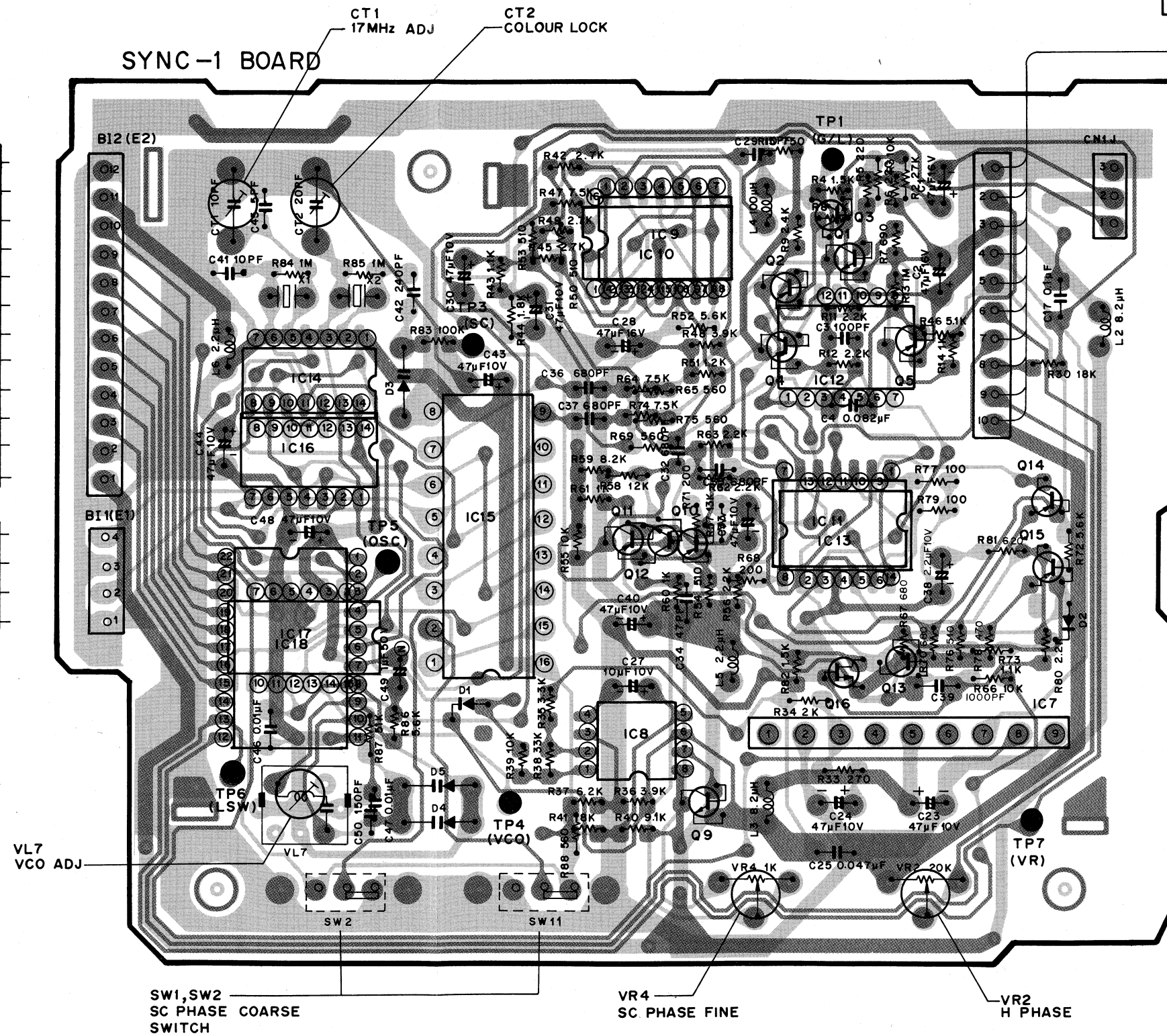
3	GROUND
2	GEN LOCK IN
1	GEN LOCK INDICATOR OUT

TO
SWITCH BOA
-----B12(I

SYNC-1 BOARD

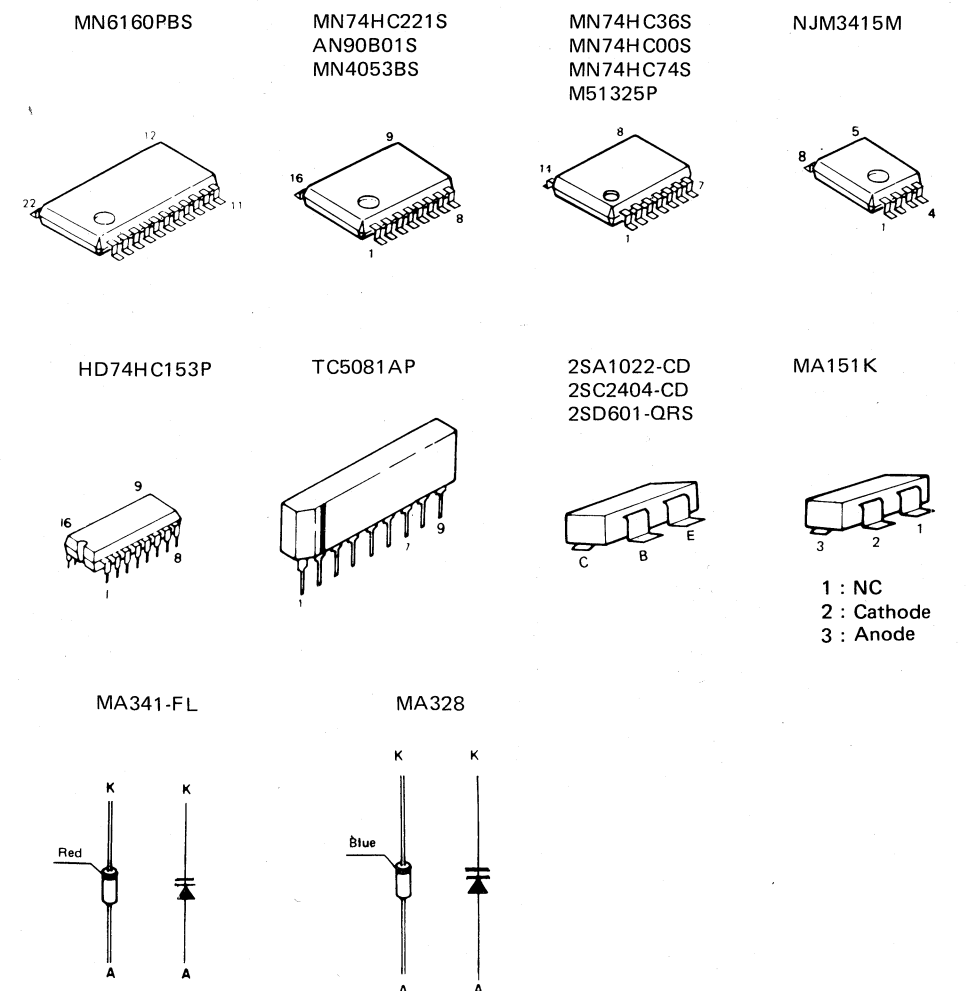
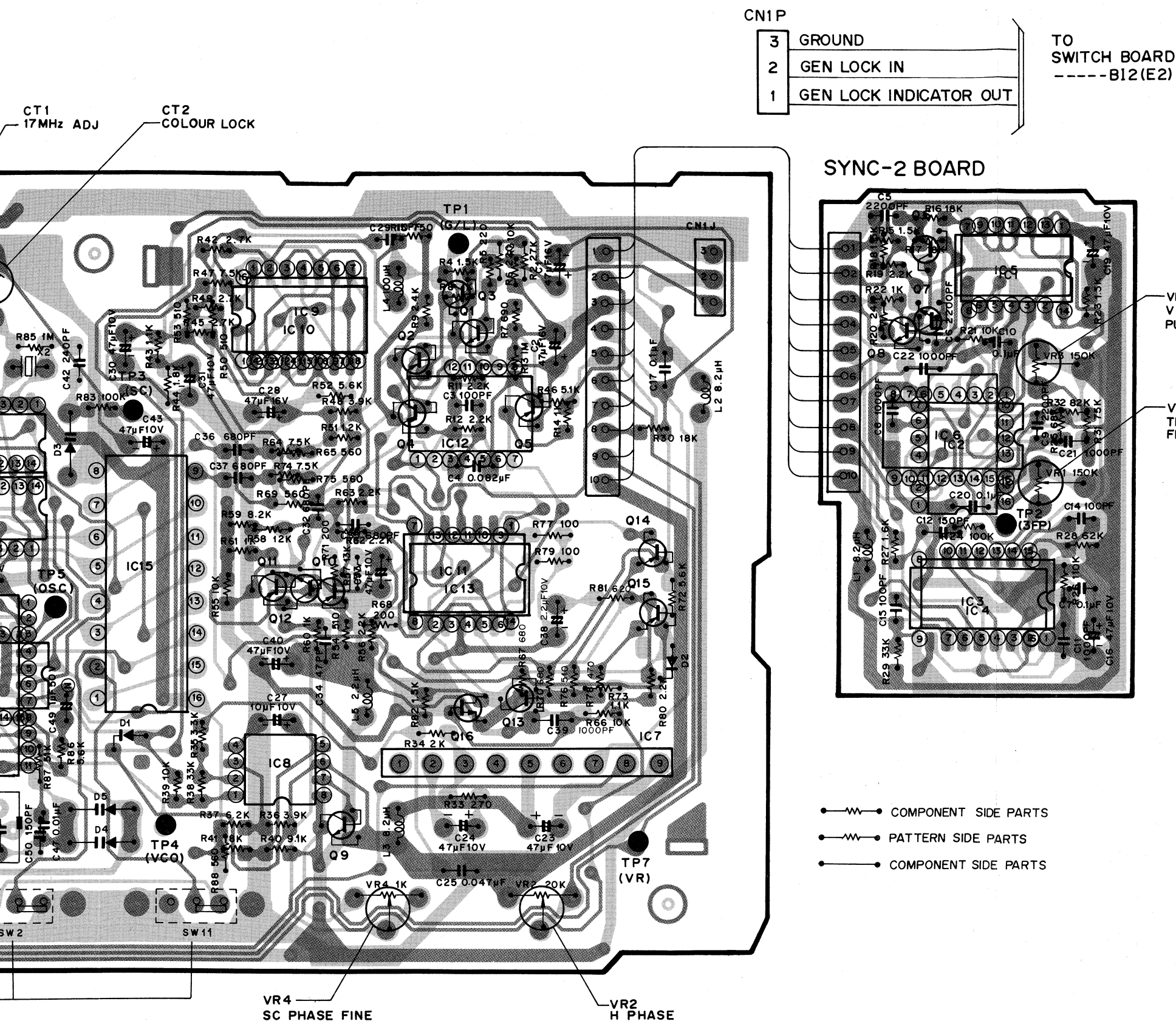
SYNC-2 BOARD

TO PROCESS BOARD -----CN10	GROUND	B12 (E2)
	+6V IN	12
	CP2 OUT	11
	CP1 OUT	10
	PRE BL OUT	9
	Vs OUT	8
	BL OUT	7
	SYNC OUT	6
	BFP OUT	5
	W BL OUT	4
TO PROCESS BOARD -----CN10	GROUND	3
	+7.6V IN (STANDBY I&2:0V)	2
TO PROCESS BOARD -----CN11	SC B-Y OUT	4
	GROUND	3
	SC R-Y OUT	2
	GROUND	1
		B11 (E1)



- COMPONENT SIDE PARTS
- PATTERN SIDE PARTS
- COMPONENT SIDE PARTS

CONDUCTOR VIEW OF SYNC-1 BOARD/SYNC-2 BOARD



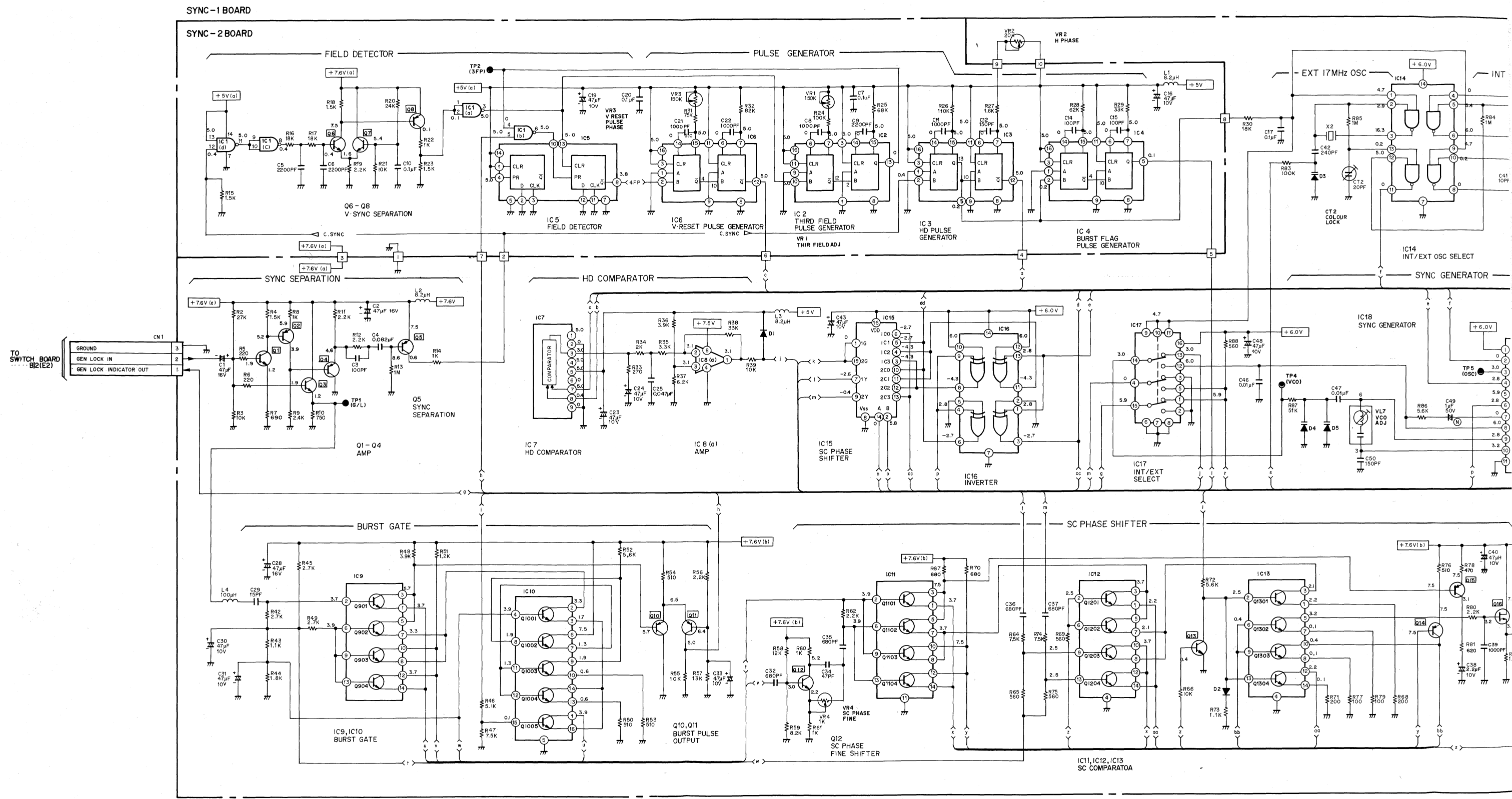
SYNC-1 BOARD

IC7	TC5081AP	B6, B7	Q14	2SA1022-BC	(E)	C7
IC8	NJM3415M	B5	Q15	2SA1022-BC	(E)	C7
IC9	M51325P	D5	Q16	2SK198-Q	(IO)	B6
IC10	AN90B01S	D5	D1	MA151K	(MH)	B4
IC11	M51325P	C6	D2	MA151K	(MH)	B7
IC12	M51325P	D6	D3	MA341-FL		D4
IC13	M51325P	C6	D4	MA328		B4
IC14	MN74HC00S	D4	D5	MA328		B4
IC15	HD74HC153P	B5, C5				
IC16	MN74HC86S	C4				
IC17	MN4053BS	B4				
IC18	MN6160PBS	B4				
Q1	2SC2404-CD	(U)	D6			
Q2	2SA1022-BC	(E)	D6			
Q3	2SC2404-CD	(U)	D6			
Q4	2SA1022-BC	(E)	D6			
Q5	2SA1022-BC	(E)	D6			
Q9	2SD601-QRS	(Y)	B5			
Q10	2SA1022-BC	(E)	C5			
Q11	2SA1022-BC	(E)	C5			
Q12	2SC2404-CD	(U)	C5			
Q13	2SC2404-CD	(U)	B6			

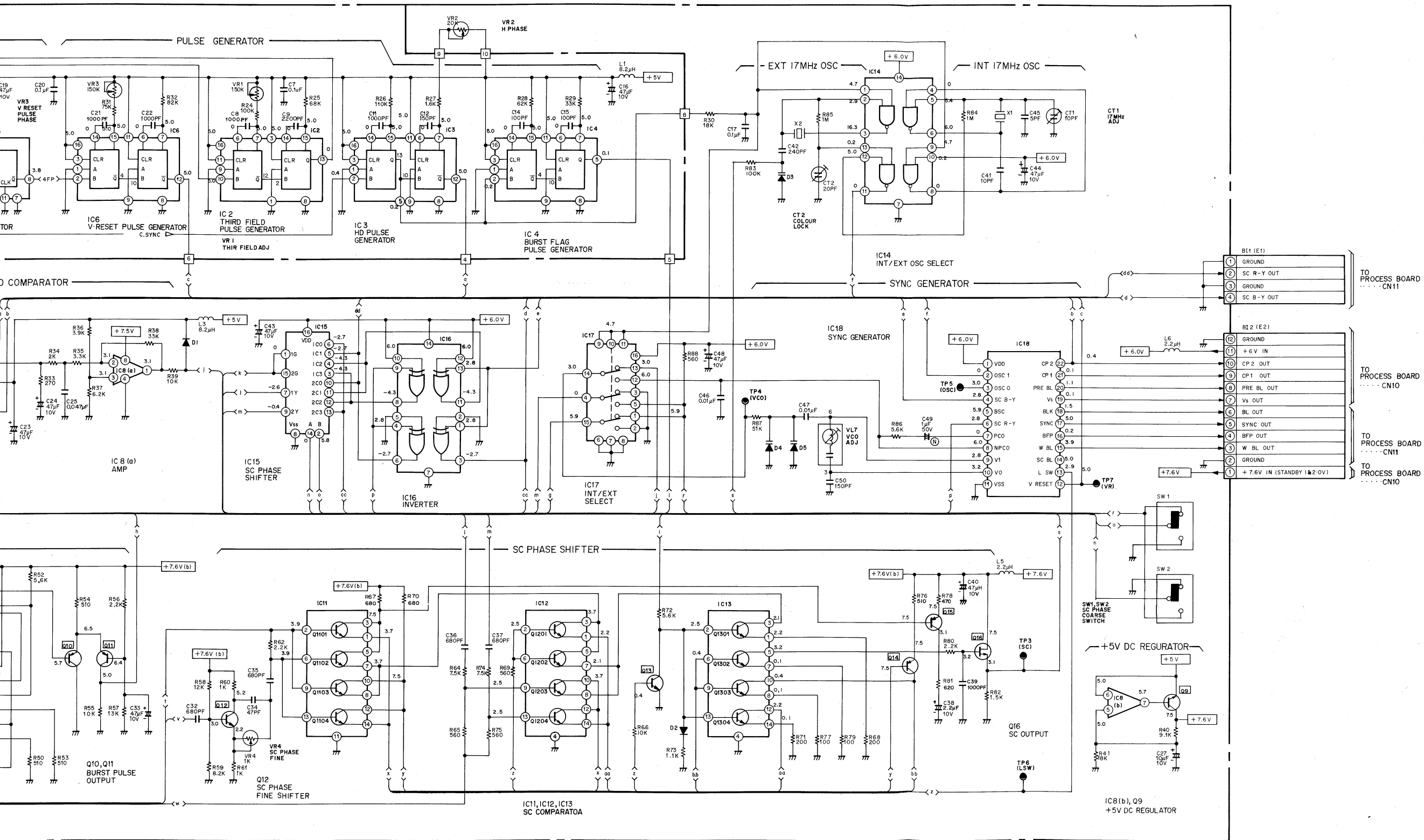
SYNC-2 BOARD

IC1	MN74HC00S		D9
IC2	MN74HC221S		B9
IC3	MN74HC221S		B9
IC4	MN74HC221S		B9
IC5	MN74HC74S		D9
IC6	MN74HC221S		B9
Q6	2SC2404-CD	(U)	D9
Q7	2SC2404-CD	(U)	D9
Q8	2SA1022-BC	(E)	D9

SCHEMATIC DIAGRAM OF SYNC-1 BOARD/SYNC-2 BOARD



SCHEMATIC DIAGRAM OF SYNC-1 BOARD/SYNC-2 BOARD



SYNC-1 BOARD

IC7	TC5081AP	B3
IC8	NJM3415M	A7, B3
IC9	M51325P	A2
IC10	AN90B01S	A3
IC11	M51325P	A4
IC12	M51325P	A5
IC13	M51325P	A5
IC14	MN74HC00S	C6
IC15	HD74HC153P	B4
IC16	MN74HC86S	B4
IC17	MN4053BS	B5
IC18	MN6160PBS	B6
Q1	2SC2404-CD	(U) B2
Q2	2SA1022-BC	(E) B2
Q3	2SC2404-CD	(U) B2
Q4	2SA1022-BC	(E) B2
Q5	2SA1022-BC	(E) B2
Q9	2SD601-QRS	(Y) A7
Q10	2SA1022-BC	(E) A3
Q11	2SA1022-BC	(E) A3
Q12	2SC2404-CD	(U) A4
Q13	2SC2404-CD	(U) A5
Q14	2SA1022-BC	(E) A6
Q15	2SA1022-BC	(E) A6
Q16	2SK198-Q	(IO) A6
D1	MA151K	(MH) B3
D2	MA151K	(MH) A5
D3	MA341-FL	C6
D4	MA328	B6
D5	MA328	B6

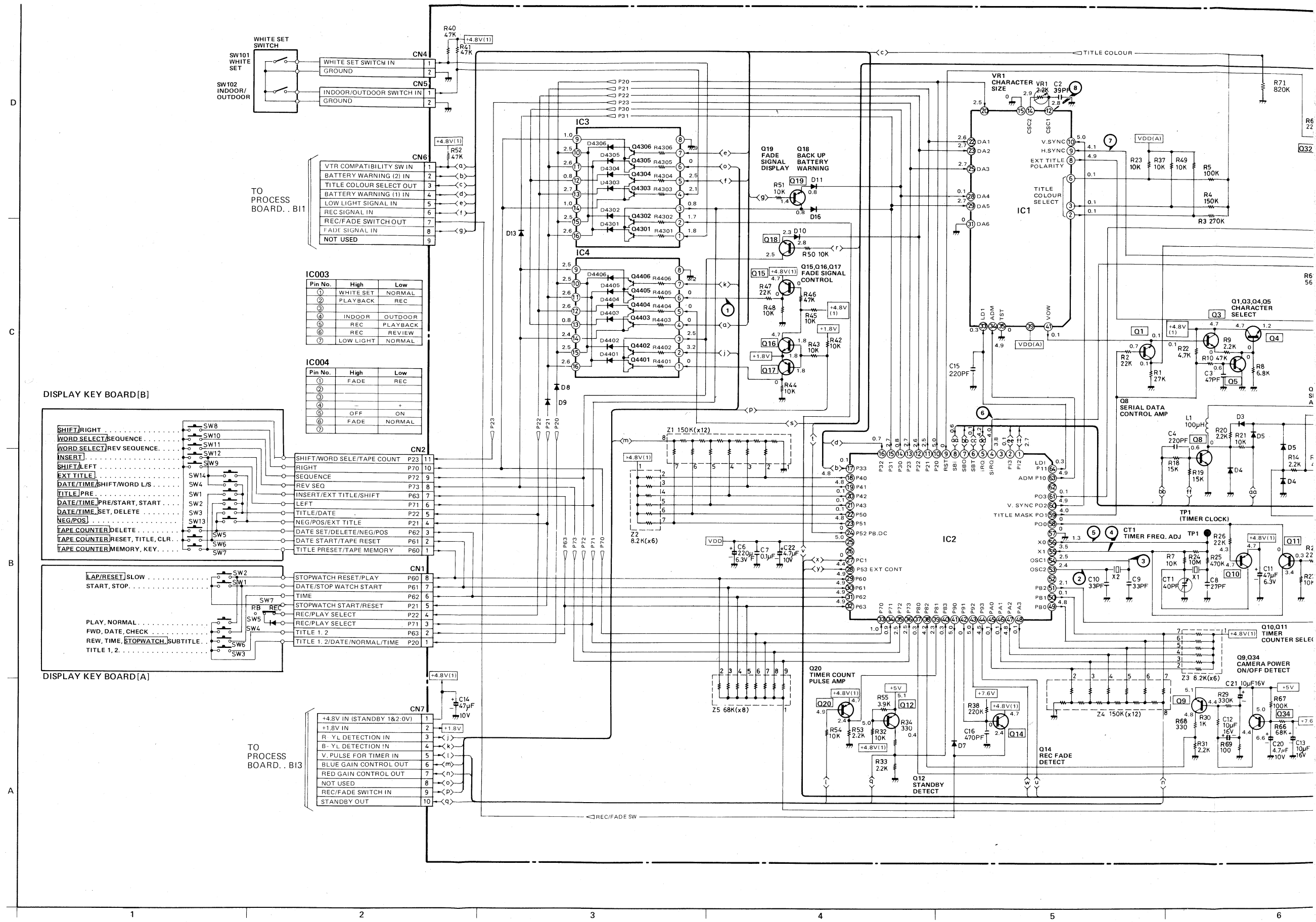
SCHEMATIC DIAGRAM OF MICROPROCESSOR BOARD

MICROPROCESSOR BOARD

MICRO PROCESSOR BOARD

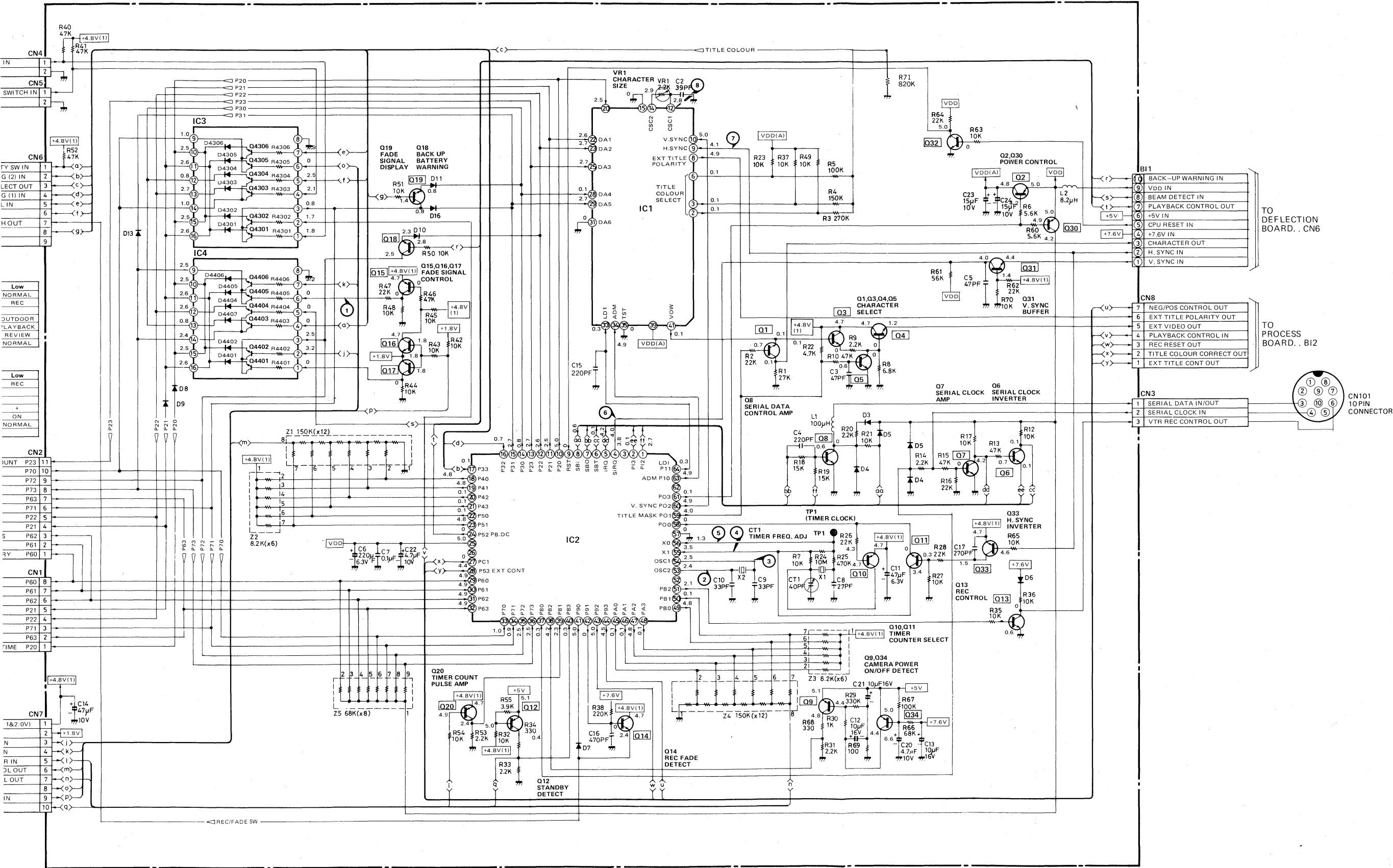
IC1	MN1237B		D5
IC2	MN1554CVG		B5
IC3	AN90B82S		D3
IC4	AN90B82S		C3
Q1	2SC2404-CD	[U]	C5
Q2	2SB709-QRS	[A]	C7
Q3	2SD601-QRS	[Y]	C6
Q4	2SD601-QRS	[Y]	C6
Q5	2SD601-QRS	[Y]	B6
Q6	2SD601-QRS	[Y]	B6
Q7	2SD601-QRS	[Y]	B6
Q8	2SD601-QRS	[Y]	B6
Q9	2SB814-RS	[1B]	A6
Q10	2SA1022-CD	[E]	B6
Q11	2SC2404-CD	[U]	B6
Q12	2SB709-QRS	[A]	A4
Q13	2SD602-QRS	[W]	B6
Q14	2SD601-QRS	[Y]	A5
Q15	2SB709-QRS	[A]	C4
Q16	2SD601-QRS	[Y]	C4
Q17	2SB709-QRS	[A]	C4
Q18	2SD601-QRS	[Y]	C4
Q19	2SD601-QRS	[Y]	D4
Q20	2SB709-QRS	[A]	A4
Q30	2SB709-QRS	[A]	C7, D7
Q31	2SD601-QRS	[Y]	C6
Q32	2SD1030-RST	[1Z]	D6
Q33	2SB709-QRS	[A]	B6
Q34	2SB709-QRS	[A]	A6

D3	MA151WK	[MT]	C6
D4	MA151WA	[MN]	B6
D5	MA151WK	[MT]	C6
D6	MA151WK	[MT]	B6
D7	MA151K	[MH]	A5
D8	MA151WA	[MN]	C3
D9	MA151K	[MH]	C3
D10	MA151K	[MH]	C4
D11	MA151K	[MH]	D4
D13	MA151WA	[MN]	C3
D16	MA151K	[MH]	D4

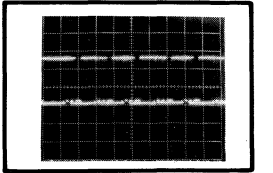


SCHEMATIC DIAGRAM OF MICROPROCESSOR BOARD

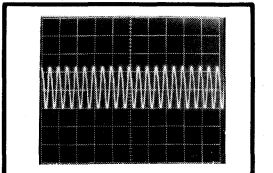
MICROPROCESSOR BOARD



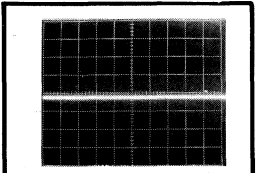
1 1V/DIV, 5ms/DIV



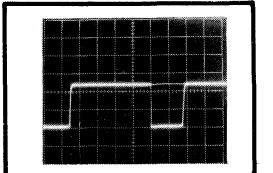
2 2V/DIV, 0.5μs/DIV



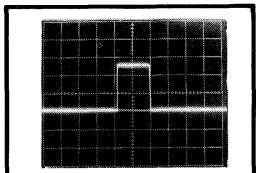
3 2V/DIV, 0.5μs/DIV



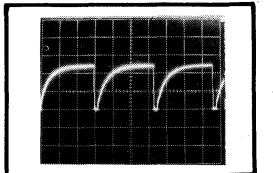
4 2V/DIV, 10μs/DIV



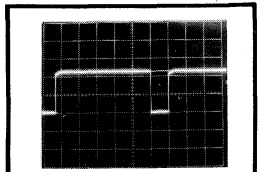
5 2V/DIV, 10μs/DIV



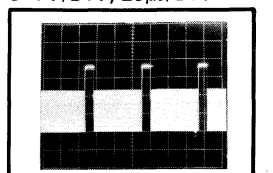
6 2V/DIV, 5ms/DIV



7 2V/DIV, 10μs/DIV

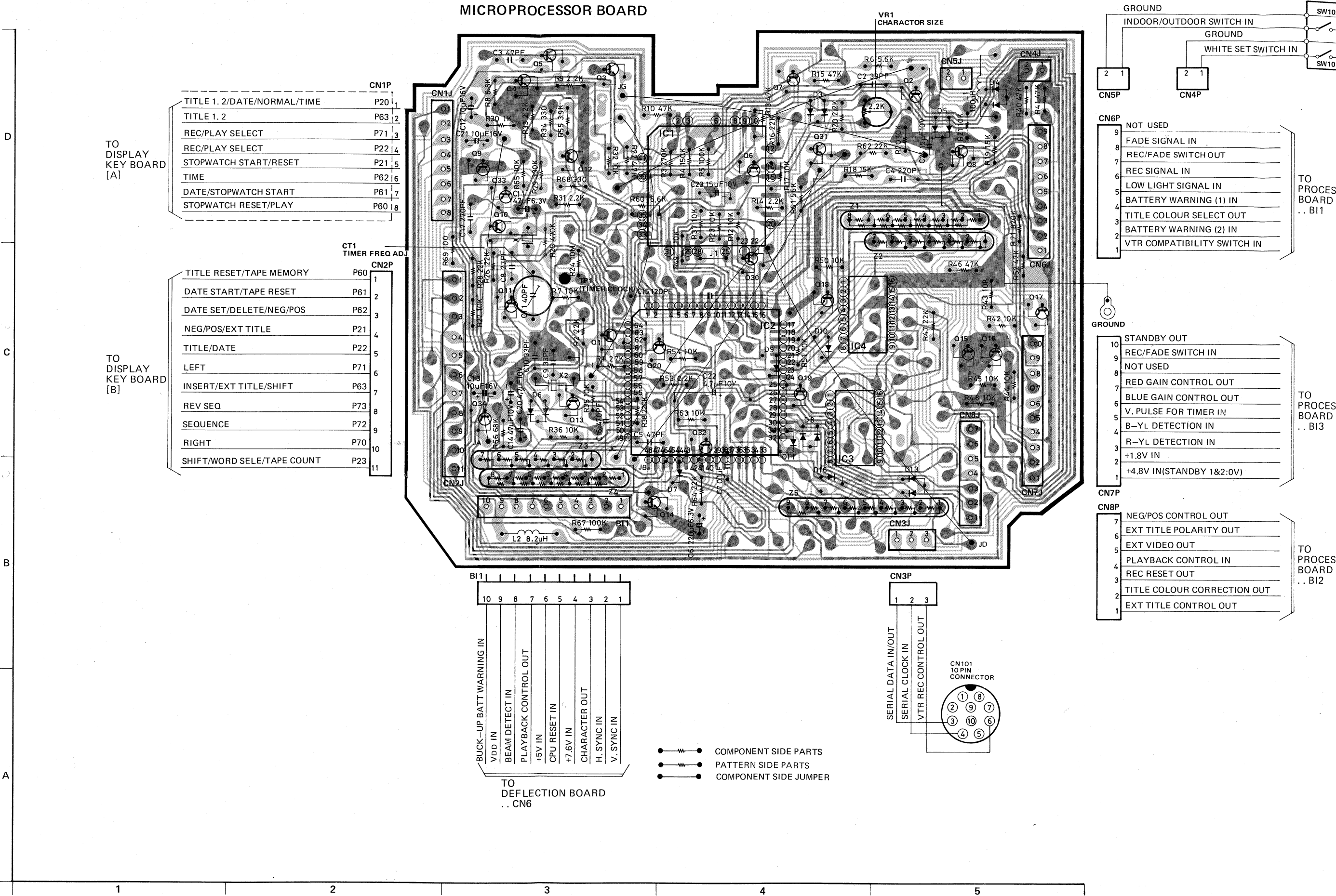


8 1V/DIV, 20μs/DIV



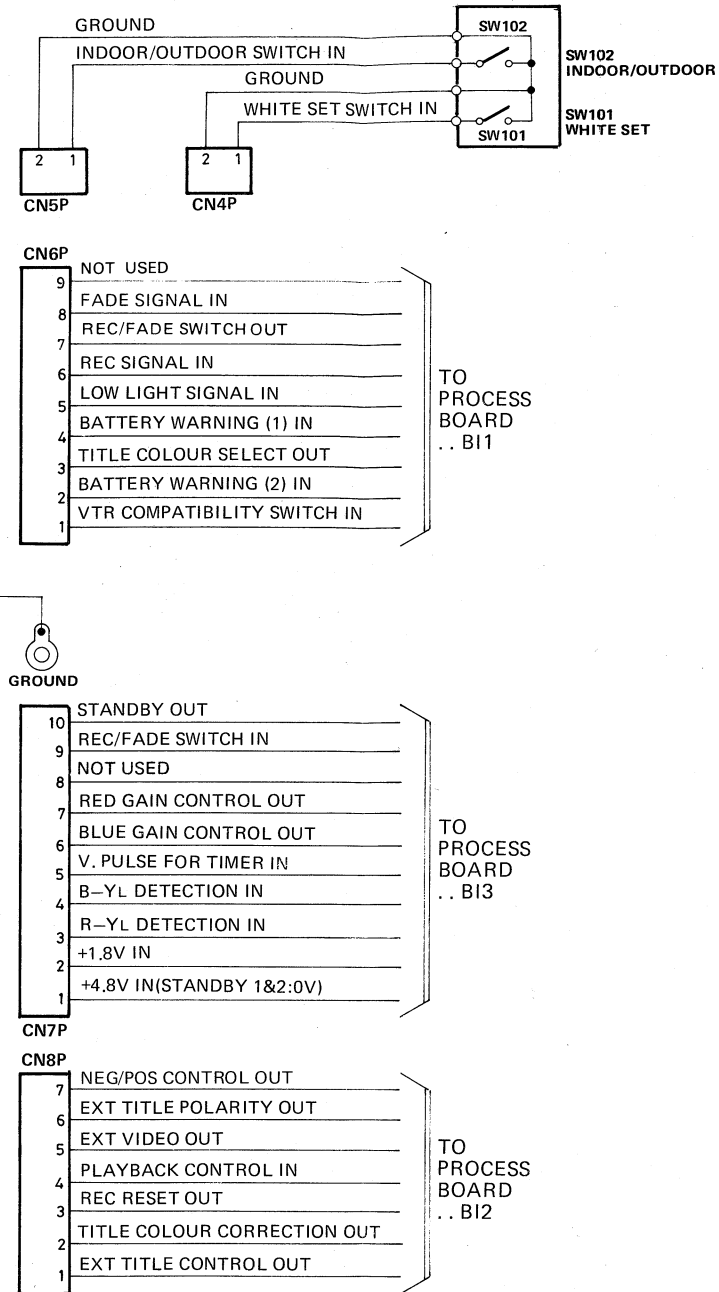
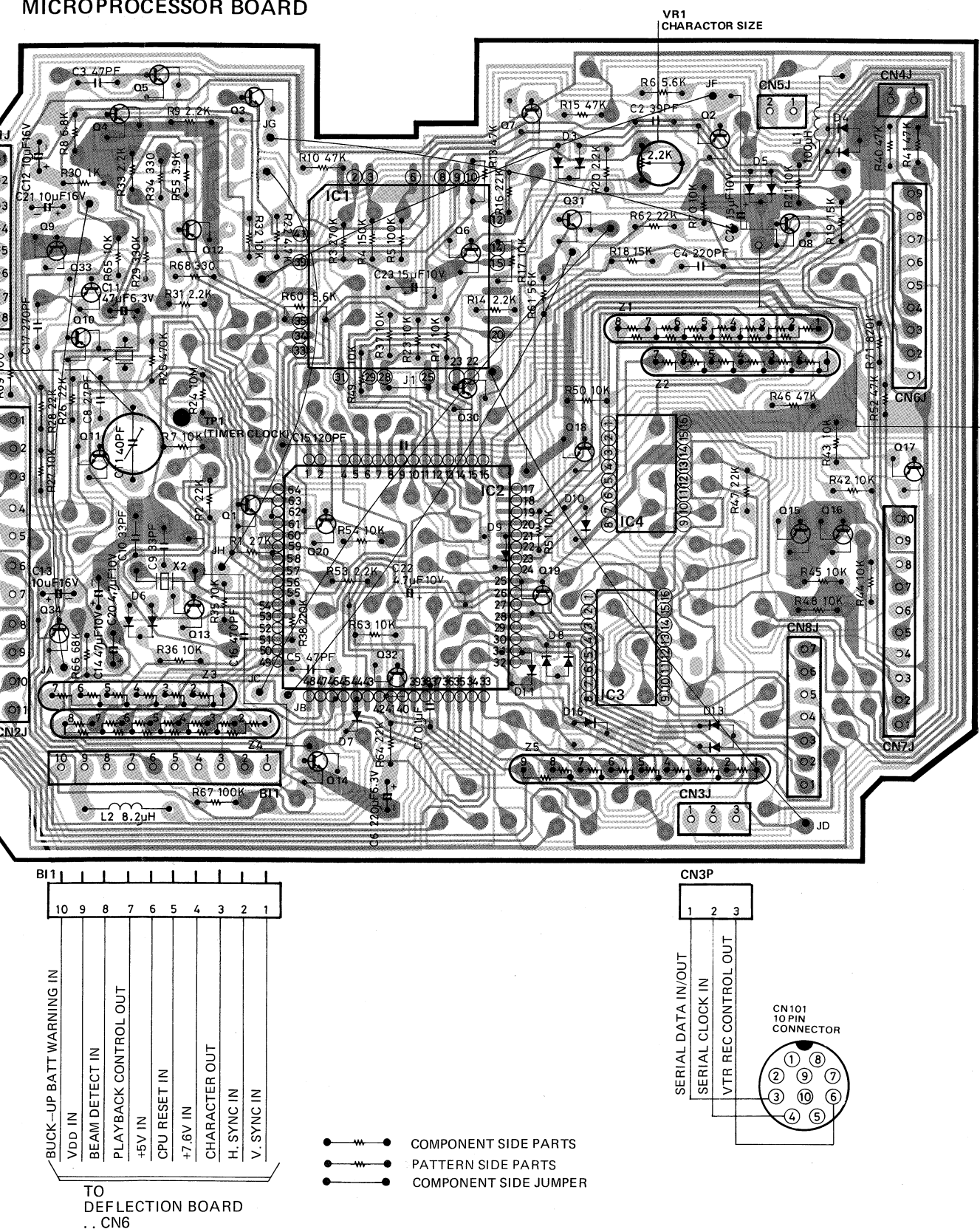
CONDUCTOR VIEW OF MICROPROCESSOR BOARD

MICROPROCESSOR BOARD

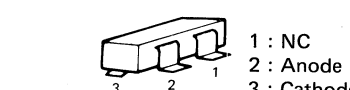
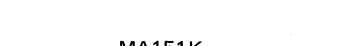
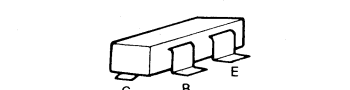
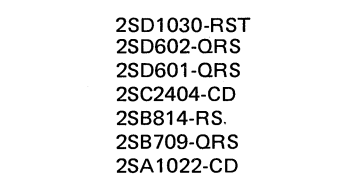
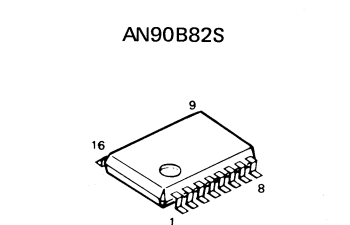
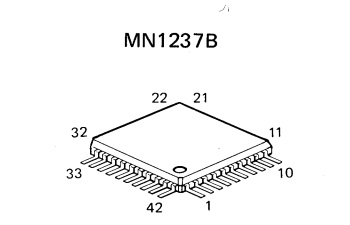
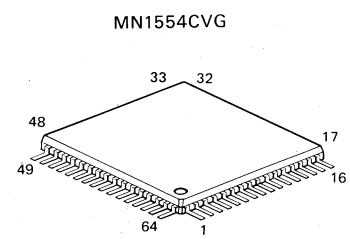


CONDUCTOR VIEW OF MICROPROCESSOR BOARD

MICROPROCESSOR BOARD



MICROPROCESSOR BOARD



IC1	MN1237B		D4
IC2	MN1554CVG		C4
IC3	AN90B82S		C4
IC4	AN90B82S		C4
Q1	2SC2404-CD	[U]	C3
Q2	2SB709-QRS	[A]	D5
Q3	2SD601-QRS	[Y]	D3
Q4	2SD601-QRS	[Y]	D3
Q5	2SD601-QRS	[Y]	D3
Q6	2SD601-QRS	[Y]	D4
Q7	2SD601-QRS	[Y]	D4
Q8	2SD601-QRS	[Y]	D5
Q9	2SB814-RS	[1B]	D3
Q10	2SA1022-CD	[E]	D3
Q11	2SC2404-CD	[U]	C3
Q12	2SB709-QRS	[A]	D3
Q13	2SD602-QRS	[W]	C3
Q14	2SD601-QRS	[Y]	B3, B4
Q15	2SB709-QRS	[A]	C5
Q16	2SD601-QRS	[Y]	C5
Q17	2SB709-QRS	[A]	C5
Q18	2SD601-QRS	[Y]	C4
Q19	2SD601-QRS	[Y]	C4
Q20	2SB709-QRS	[A]	C3, C4
Q30	2SB709-QRS	[A]	C4
Q31	2SD601-QRS	[Y]	D4
Q32	2SD1030-RST	[1Z]	C4
Q33	2SB709-QRS	[A]	D3
Q34	2SB709-QRS	[A]	C3
D3	MA151WK	[MT]	D4
D4	MA151WA	[MN]	D5
D5	MA151WK	[MT]	D5
D6	MA151WK	[MT]	C3
D7	MA151K	[MH]	B4
D8	MA151WA	[MN]	C4
D9	MA151K	[MH]	C4
D10	MA151K	[MH]	C4
D11	MA151K	[MH]	C4
D13	MA151WA	[MN]	B5
D16	MA151K	[MH]	B4

1 : NC
2 : Anode
3 : Cathode

1 : Anode
2 : Anode
3 : Cathode

1 : Cathode
2 : Cathode
3 : Anode

PRODUCT SAFETY NOTE

The shaded area on this schematic diagram incorporates special features important for protection from X-Radiation, fire and electrical shock hazards. When servicing it is essential that only manufacturer's specified parts be used for the critical components in the shaded areas of the schematic.

DEFLECTION BOARD

IC1	NJM2048MC	A2
IC2	NJM3415M	A4,D3
IC3	NJM3415M	D4
IC4	NJM2903M	B2,B6
IC5	AN2510S	C3,B3

Q1	2SB837-CD	B2
Q2	2SD601-QRS	[Y] B2
Q3	2SB709-QRS	[A] B2
Q4	2SB709-QRS	[A] A3
Q5	2SB709-QRS	[A] A4
Q6	2SD601-QRS	[Y] A5
Q7	2SD973-QRS	A4
Q8	2SB710-QRS	[C] A4
Q9	2SB710-QRS	[C] C2
Q11	2SD1030RST	[1Z] A5
Q12	2SC2404-CD	[U] A5
Q13	2SD1030-T	[1Z] A5
Q14	2SD601-QRS	[Y] C2
Q15	2SD602-QRS	[W] D2
Q16	2SD1083	D2
Q17	2SC2405STU	[S] D3
Q18	2SD814-QRS	[P] D5
Q19	2SB814-QRS	[1B] D5
Q20	2SB814-QRS	[1B] D5
Q21	2SD601-QRS	[Y] D5
Q22	2SB814-RS	[1B] D6
Q24	2SB709-QRS	[A] A3
Q25	2SD601-QRS	[Y] A3
Q26	2SD602-QRS	[W] C5
Q27	2SD1083	C5
Q28	2SB814-QRS	[1B] C5
Q29	2SB793-RS	A3
Q30	2SD601-QRS	[Y] C2
Q31	2SD601-QRS	[Y] C2
Q32	2SB814-RST	[1B] C6
Q33	2SD814-QRS	[P] C6
Q40	2SD1030RST	[1Z] A5

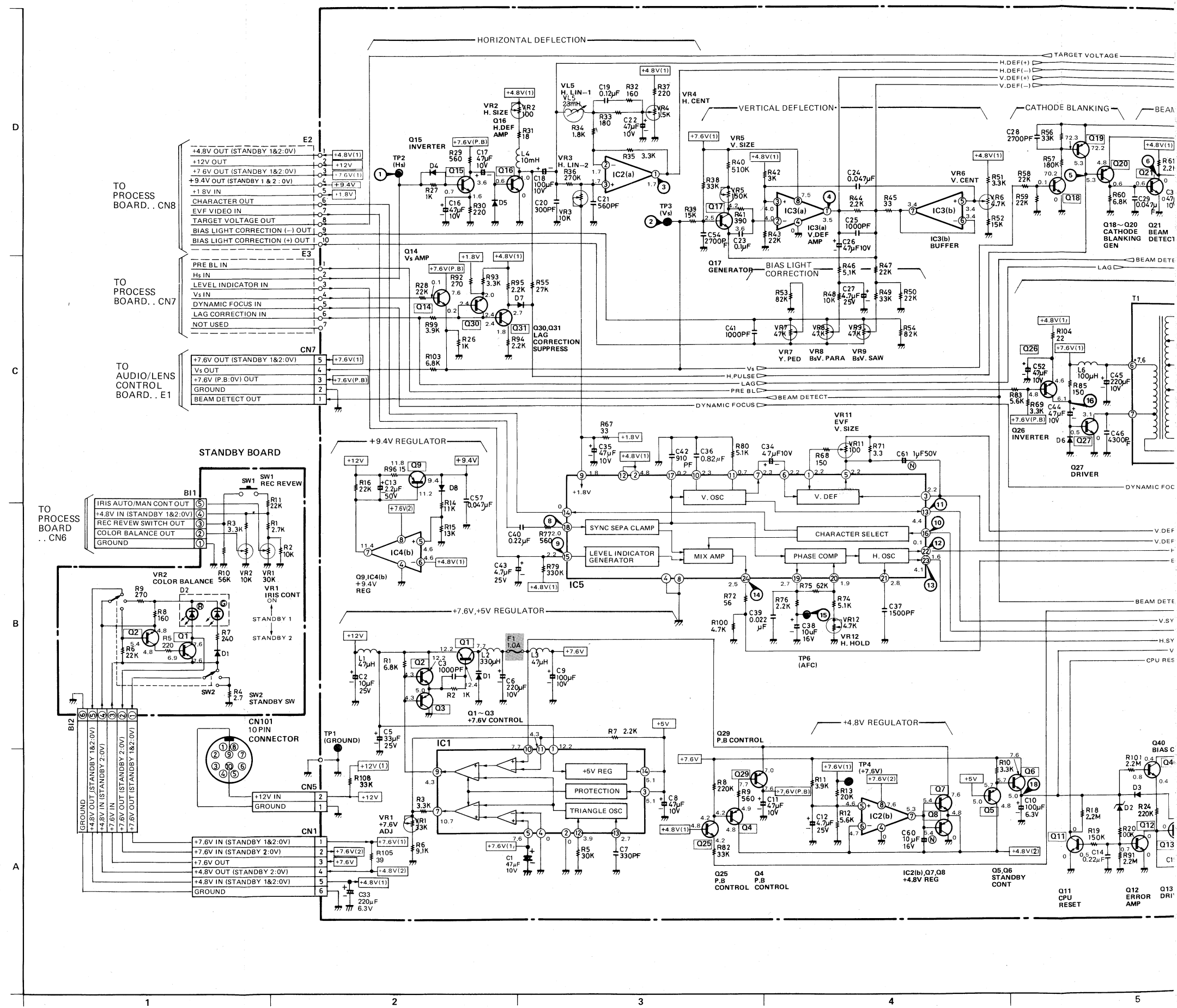
D1	EK14	B2
D2	HZ3BLL	A5
D3	MA151K	[MH] A5
D4	MA165	D2
D5	MA151K	[MH] D2
D6	MA165	C5
D7	MA171	C3
D8	MA153	[MC] C2

STANDBY BOARD

Q1	2SB793-QRS	B1
Q2	2SD636-QRS	B1
D1	MA165	B1
D2	LN11WP23F	B1

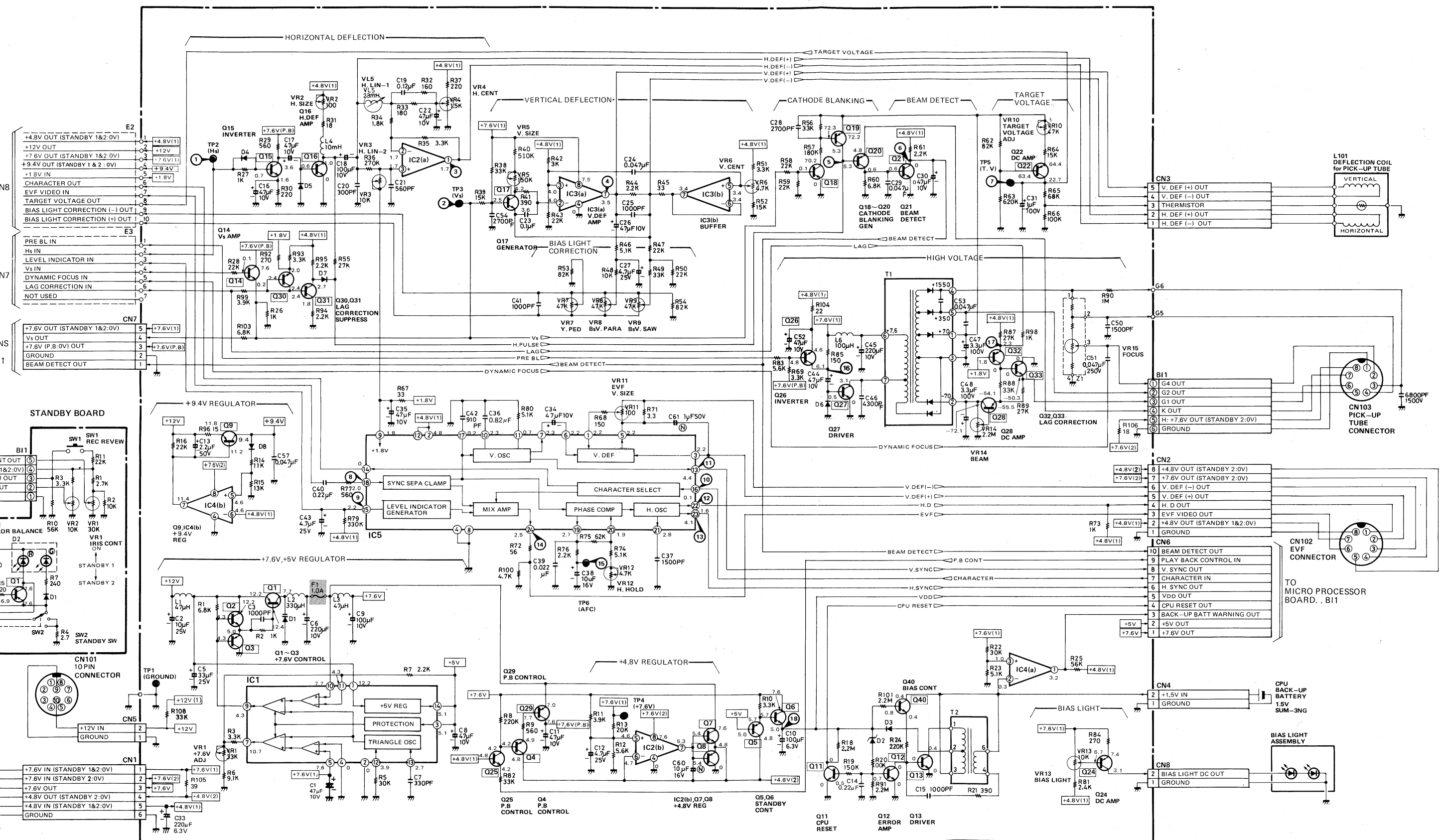
SCHEMATIC DIAGRAM OF DEFLECTION BOARD

DEFLECTION BOARD



SCHEMATIC DIAGRAM OF DEFLECTION BOARD

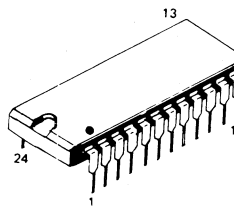
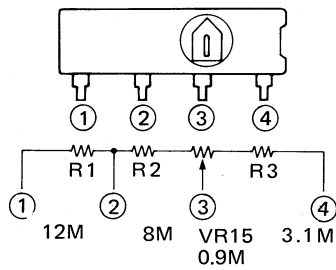
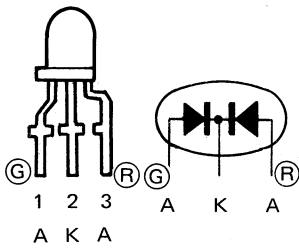
DEFLECTION BOARD



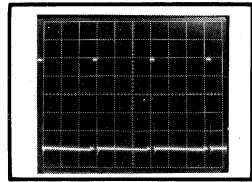
STANDBY BOARD
LN11WP23F

BLOCK RESISTOR
EVM78GA00116

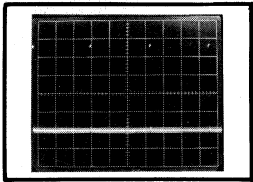
AN2510S



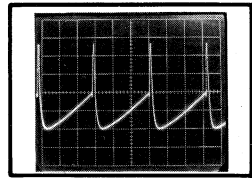
1 1V/DIV, 20μs/DIV



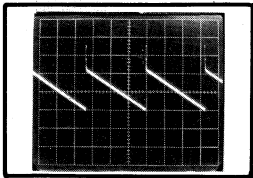
2 1V/DIV, 5ms/DIV



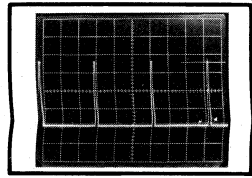
3 1V/DIV, 20μs/DIV



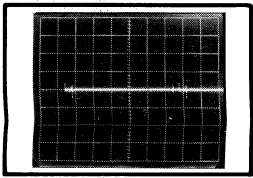
4 0.5V/DIV, 5ms/DIV



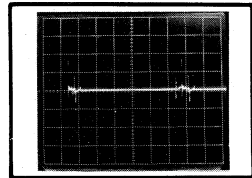
5 20V/DIV, 20μs/DIV



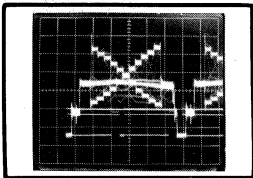
6 0.2V/DIV, 10μs/DIV



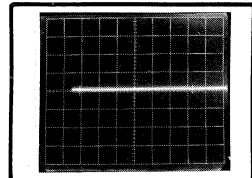
7 0.1V/DIV, 10μs/DIV



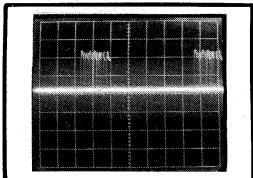
8 0.2V/DIV, 10μs/DIV



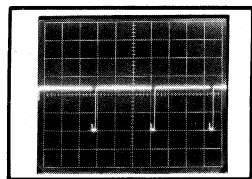
9 0.2V/DIV, 10μs/DIV



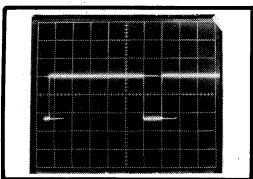
10 2V/DIV, 10μs/DIV



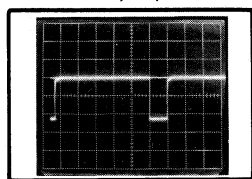
11 2V/DIV, 5ms/DIV



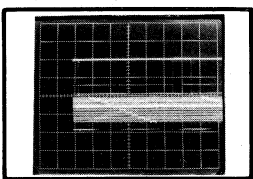
12 2V/DIV, 10μs/DIV



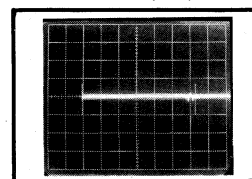
13 2V/DIV, 10μs/DIV



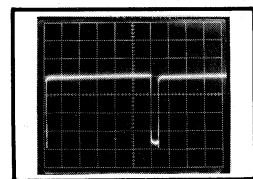
14 1V/DIV, 10μs/DIV



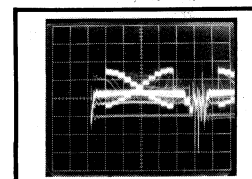
15 50mV/DIV, 10μs/DIV



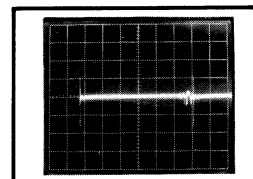
16 0.5V/DIV, 10μs/DIV



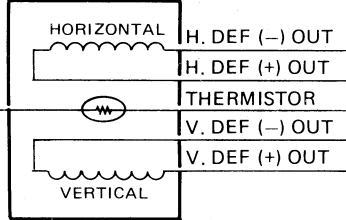
17 20mV/DIV, 10μs/DIV



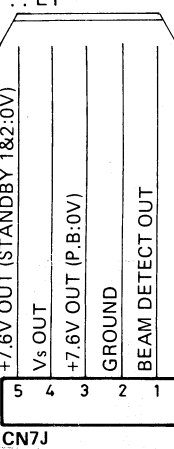
18 20mV/DIV, 10μs/DIV



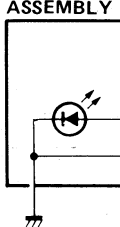
L101
DEFLECTION COIL
for PICK-UP TUBE



TO AUDIO BOARD
... E1



BIAS LIGHT
ASSEMBLY



GROUND

H: +7.6V OUT (STANDBY 2:0V)

K OUT

G1 OUT

G2 OUT

G4 OUT

CN103
PICK-UP TUBE
CONNECTOR

BI1

6

5

4

3

2

1

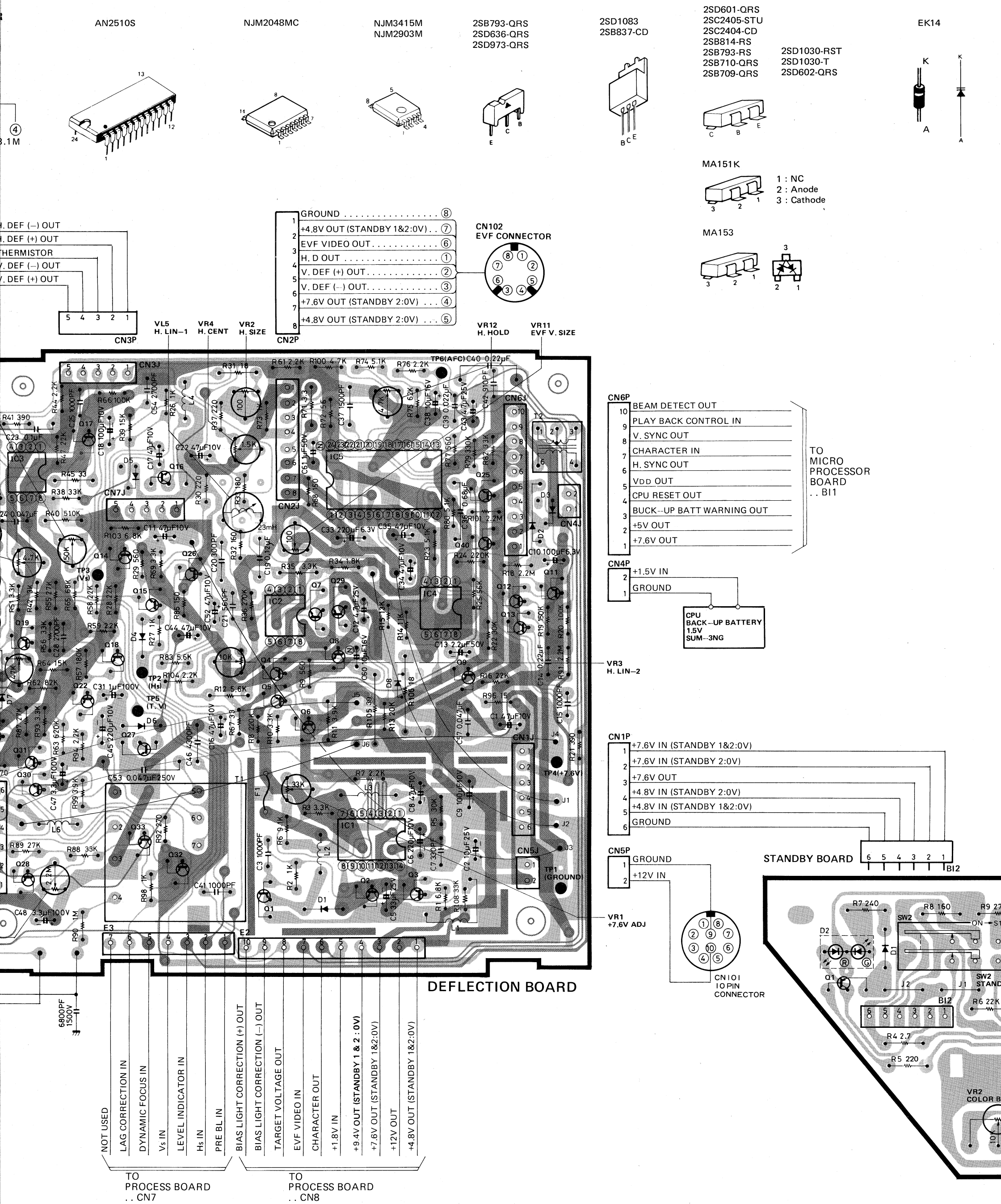
VR15
FOCUS

VR14
BEAM

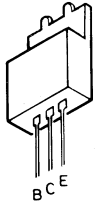
- — — ● COMPONENT SIDE PARTS
- — — ● PATTERN SIDE PARTS
- — — ● COMPONENT SIDE JUMPER

NOT USED
LAG CORRECTION IN
DYNAMIC FOCUS IN
Vs IN
TO PROCESS
... CN7

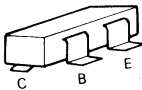
CONDUCTOR VIEW OF DEFLECTION BOARD



2SD1083
2SB837-CD

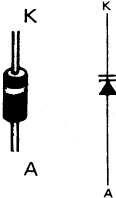


2SD601-QRS
2SC2405-STU
2SC2404-CD
2SB814-RS
2SB793-RS
2SB710-QRS
2SB709-QRS

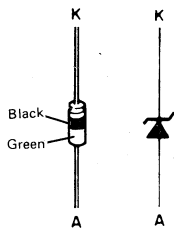


2SD1030-RST
2SD1030-T
2SD602-QRS

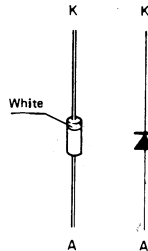
EK14



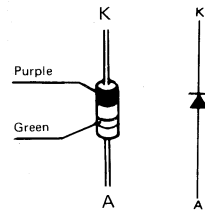
HZ3BLL



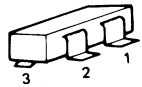
MA165



MA171

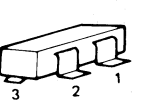


MA151K



1 : NC
2 : Anode
3 : Cathode

MA153

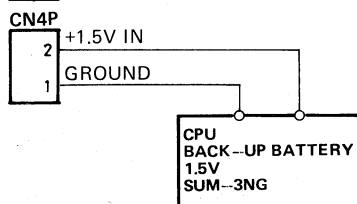
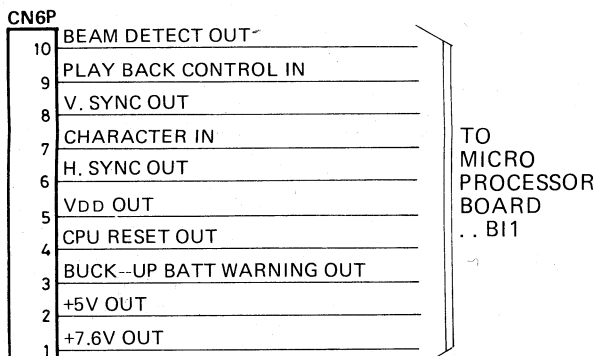


DEFLECTION BOARD

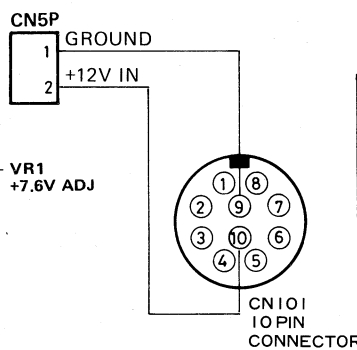
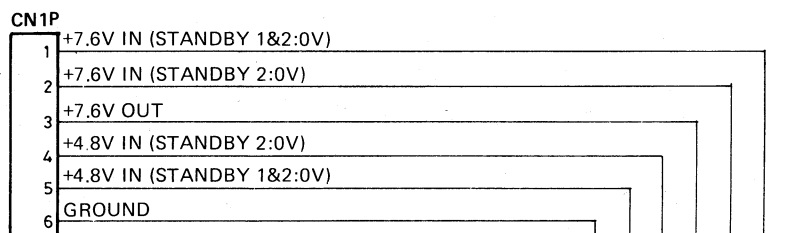
IC1	NJM2048MC	B3	Q21	2SD601-QRS	[Y]	C2
IC2	NJM3415M	C3	Q22	2SB814-RS	[1B]	C2
IC3	NJM3415M	C2	Q24	2SB709-QRS	[A]	B2
IC4	NJM2903M	C4	Q25	2SD601-QRS	[Y]	C4
IC5	AN2510S	C3	Q26	2SD602-QRS	[W]	C3
Q1	2SB837-CD	B3	Q27	2SD1083		B3
Q2	2SD601-QRS	[Y]	Q28	2SB814-QRS	[1B]	B2
Q3	2SB709-QRS	[A]	Q29	2SB793-RS		C3
Q4	2SB709-QRS	[A]	Q30	2SD601-QRS	[Y]	B2
Q5	2SB709-QRS	[A]	Q31	2SD601-QRS	[Y]	B2
Q6	2SD601-QRS	[Y]	Q32	2SB814-RST	[1B]	B3
Q7	2SD973-QRS	C3	Q33	2SD814-QRS	[P]	B3
Q8	2SB710-QRS	[C]	Q40	2SD1030RST	[1Z]	C4
Q9	2SB710-QRS	[C]	D1	EK14		B3
Q11	2SD1030RST	[1Z]	D2	HZ3BLL		C4
Q12	2SC2404-CD	[U]	D3	MA151K	[MH]	C4
Q13	2SD1030-T	[1Z]	D4	MA165		C3
Q14	2SD601-QRS	[Y]	D5	MA151K	[MH]	C3
Q15	2SD602-QRS	[W]	D6	MA165		B3
Q16	2SD1083	C3	D7	MA171		C2
Q17	2SC2405STU	[S]	D8	MA153	[MC]	B3
Q18	2SD814-QRS	[P]				
Q19	2SB814-QRS	[1B]				
Q20	2SB814-QRS	[1B]				

STANDBY BOARD

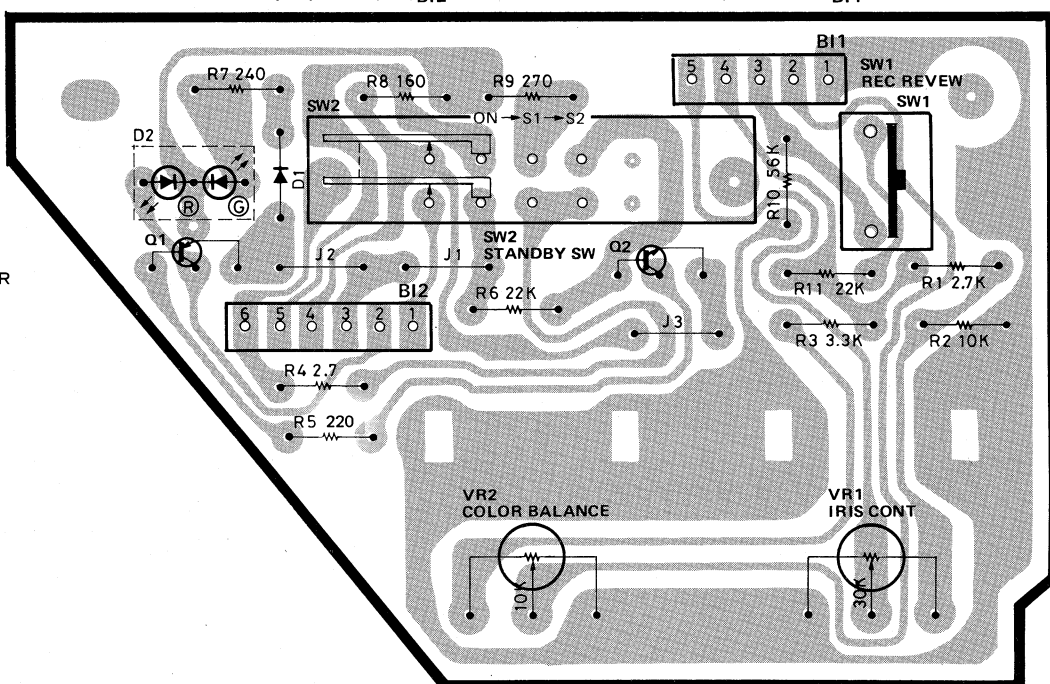
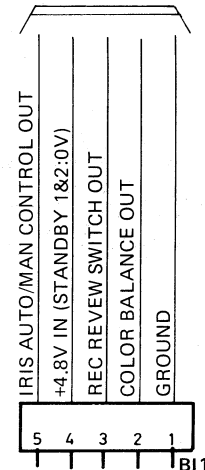
Q1	2SB793-QRS	A5
Q2	2SD636-QRS	A6
D1	MA165	B5
D2	LN11WP23F	B5



VR3
H. LIN-2



TO
PROCESS BOARD
.. CN6



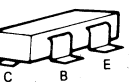
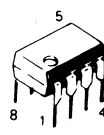
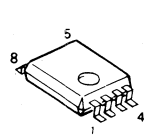
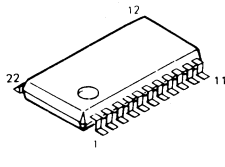
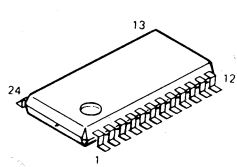
AN2560S
AN2110S
AN2310S
AN2320S
AN2210SA

AN2410S
MN6160PBS

AN6914S
NJM3414M

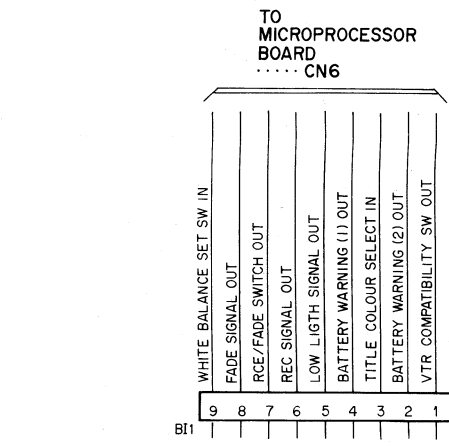
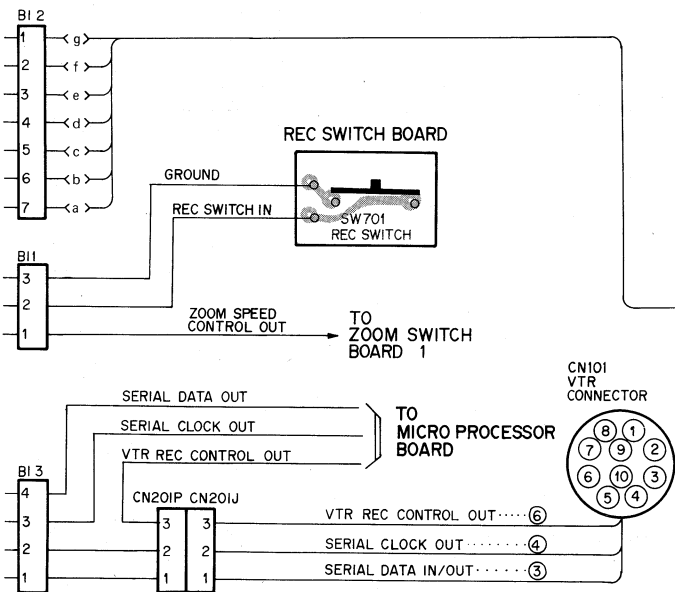
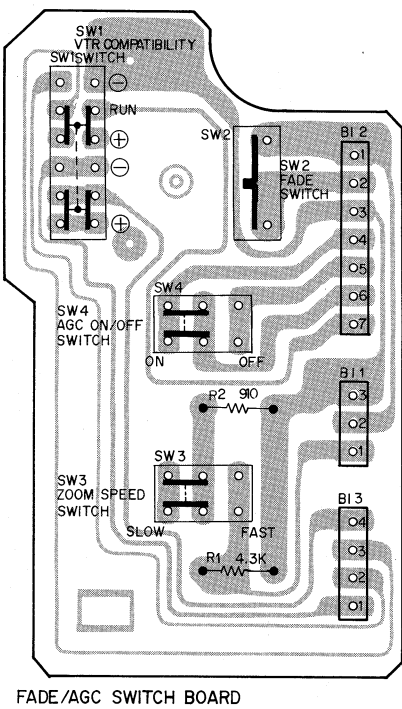
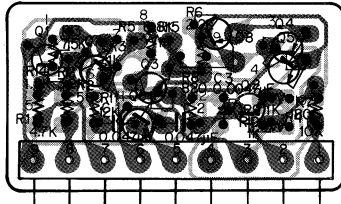
MN8037

2SD602-QRS
2SD601-QRS
2SC2404-CD
2SB710-QRS
2SB709-QRS
2SA1034-ST

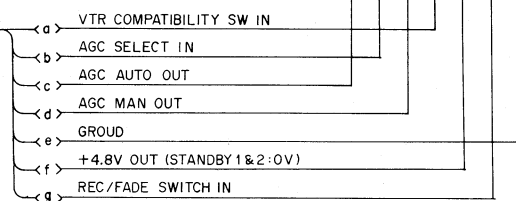
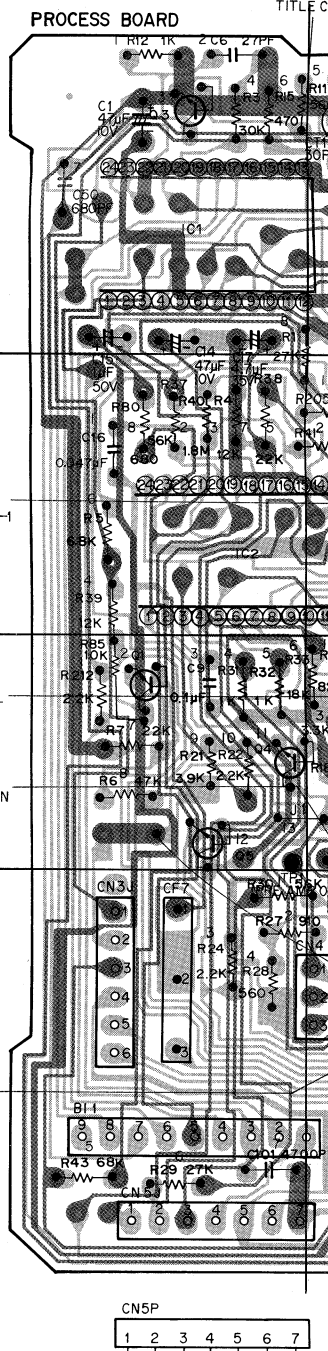
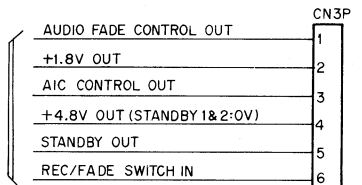


- COMPONENT SIDE PARTS
- PATTERN SIDE PARTS
- COMPONENT SIDE JUMPER
- PATTERN SIDE JUMPER

SUBPROCESS BOARD



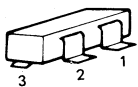
TO AUDIO/LENS CONTROL BOARD



CONDUCTOR VIEW OF PROCESS BOARD

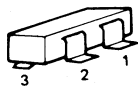
2SD602-QRS
2SD601-QRS
2SC2404-CD
2SB710-QRS
2SB709-QRS
2SA1034-ST

MA151A



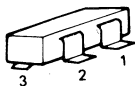
1 : NC
2 : Cathode
3 : Anode

MA151K



1 : NC
2 : Anode
3 : Cathode

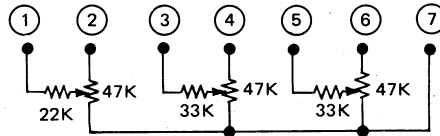
MA151WA



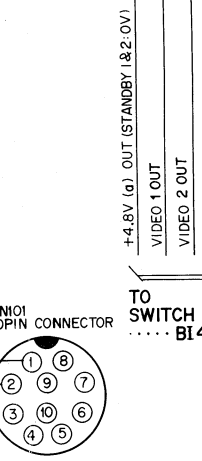
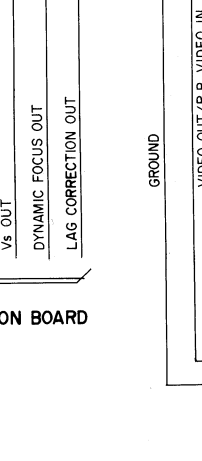
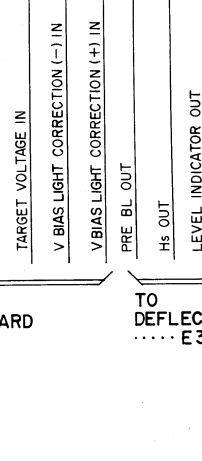
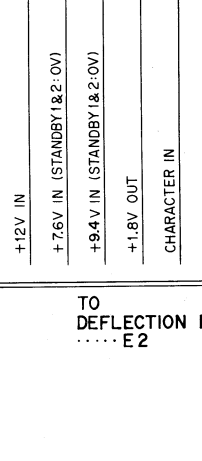
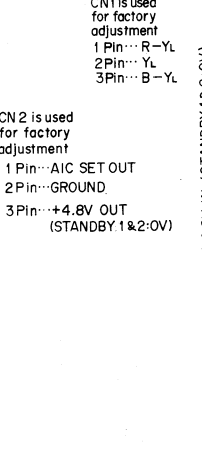
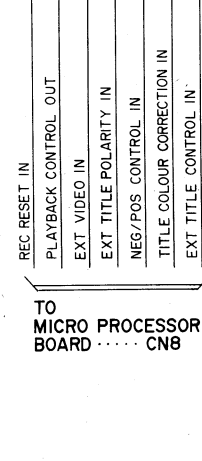
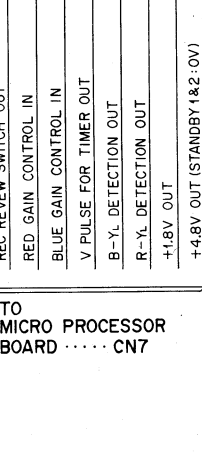
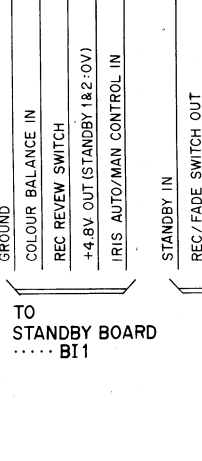
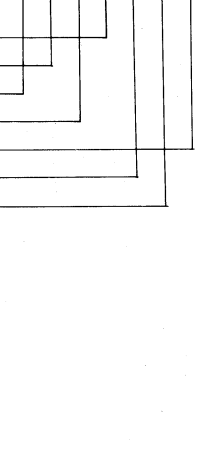
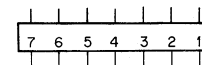
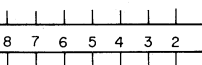
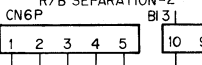
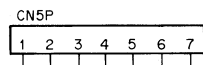
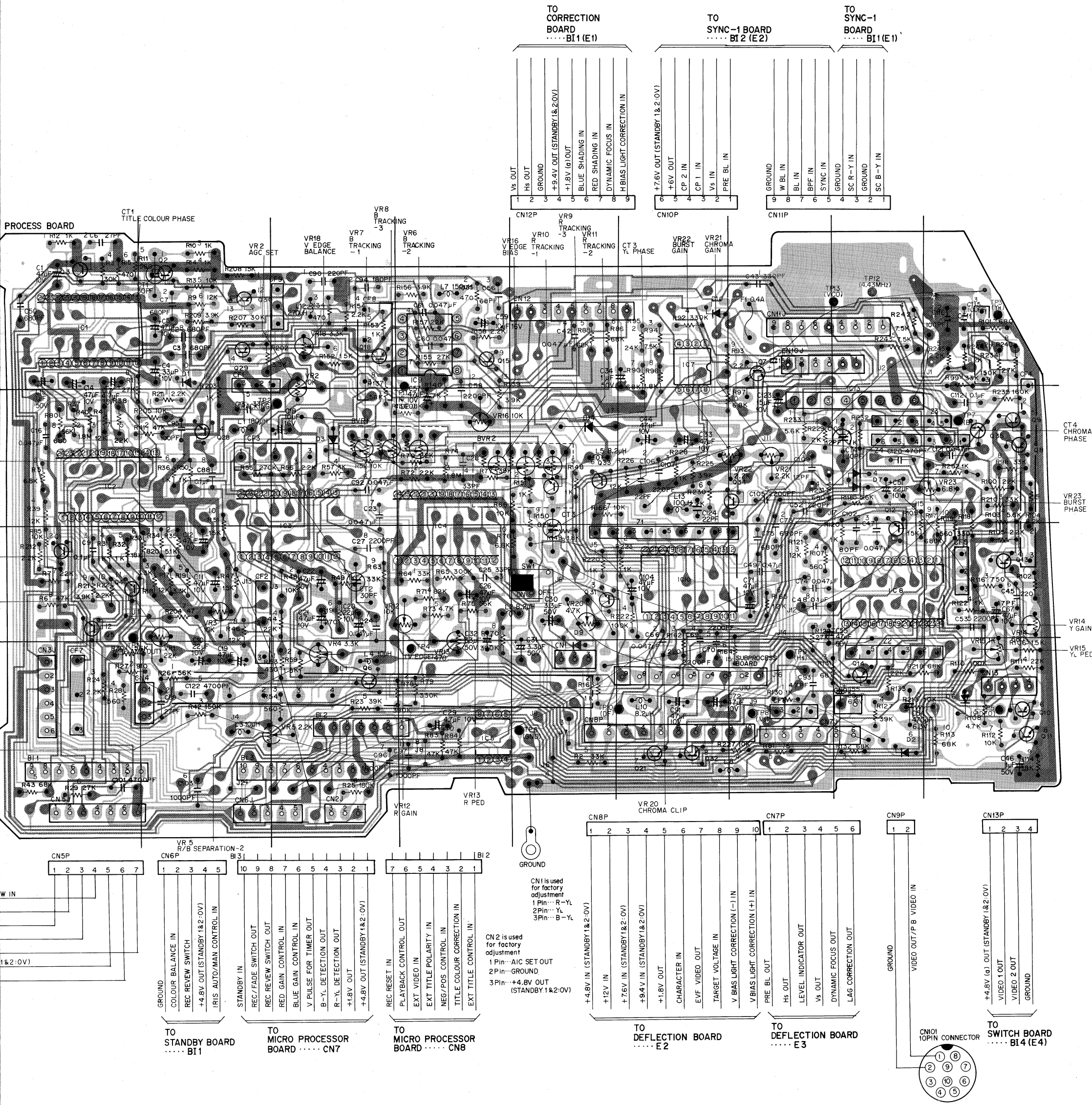
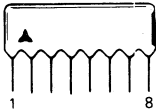
1 : Cathode
2 : Cathode
3 : Anode

Z4 EXBF6L323J
Z3 EXBF5L324J
Z2 EXBD85322S
Z1 EXBD87321JW
IC13 MT0001
IC12 EHMB09H85

BLOCK VARIABLE RESISTOR

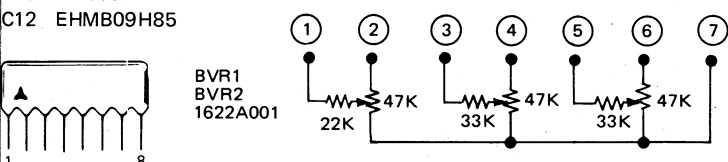


BVR1
BVR2
1622A001

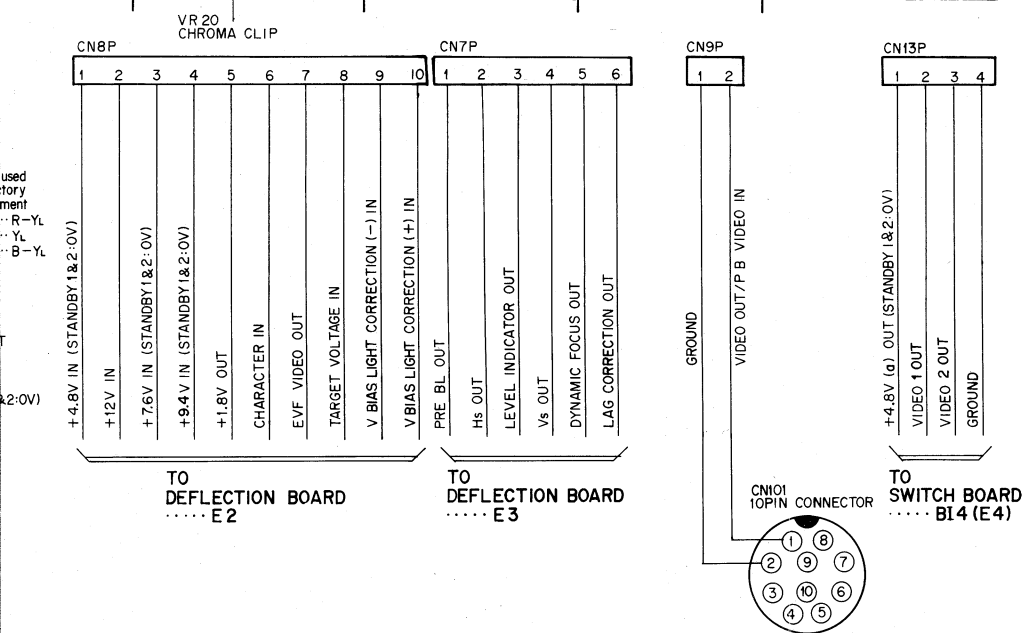
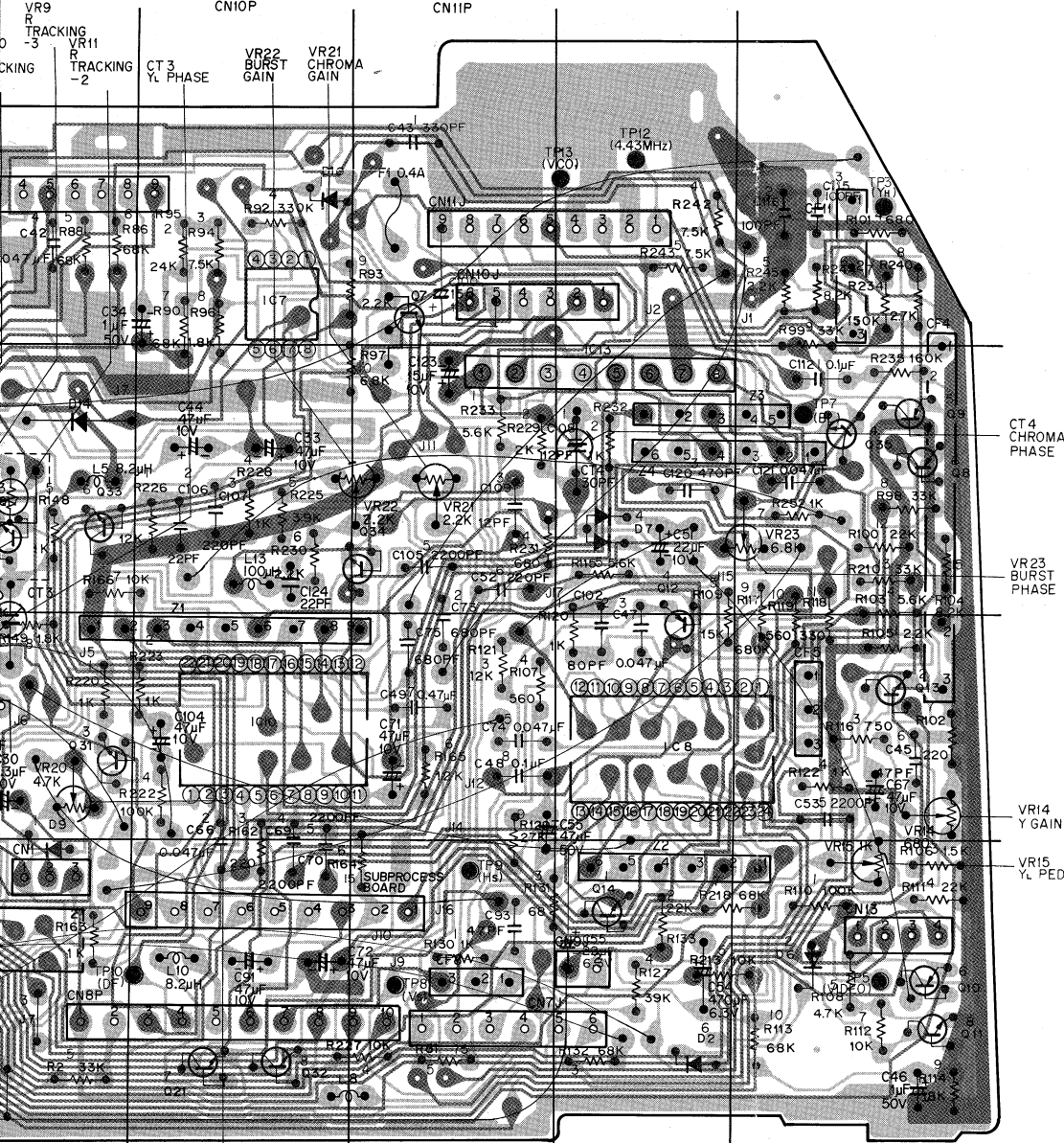
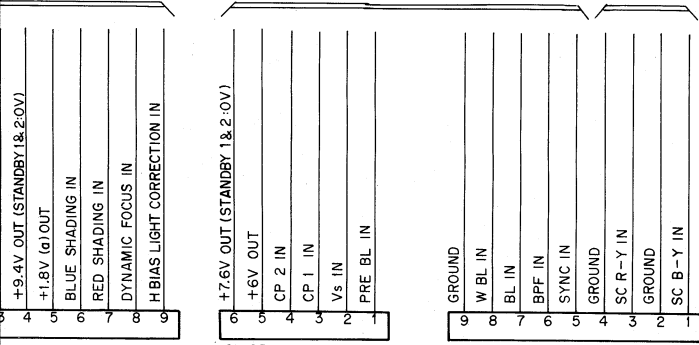


24 EXBF6L323J
 23 EXBF5L324J
 22 EXBD85322S
 21 EXBD87321JW
 C13 MT0001
 C12 EHMB09H85

BLOCK VARIABLE RESISTOR

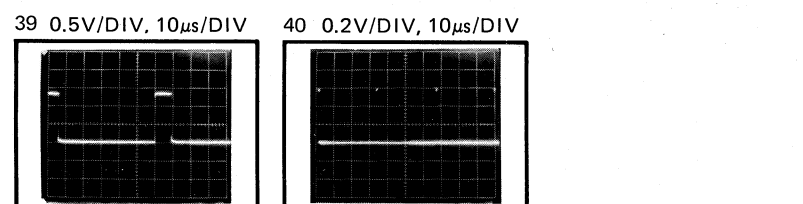
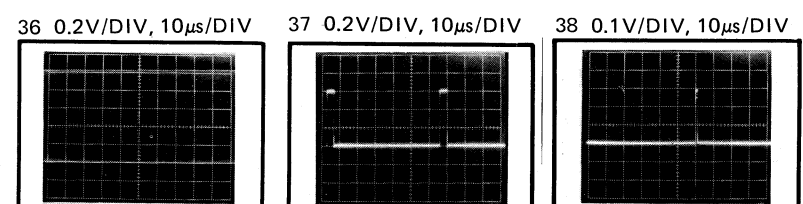
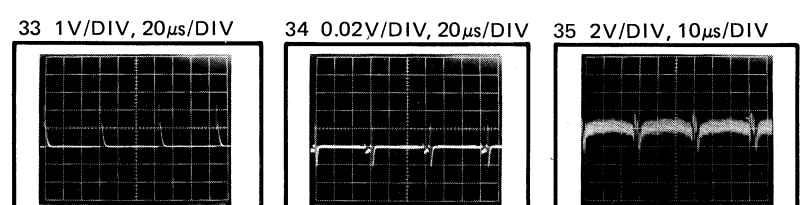
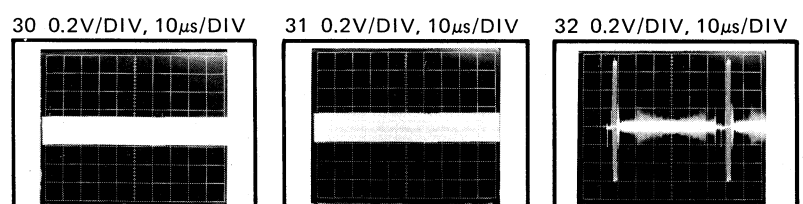
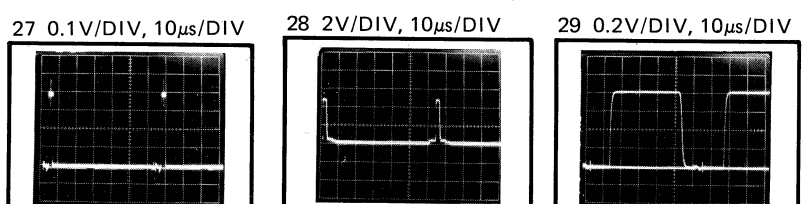
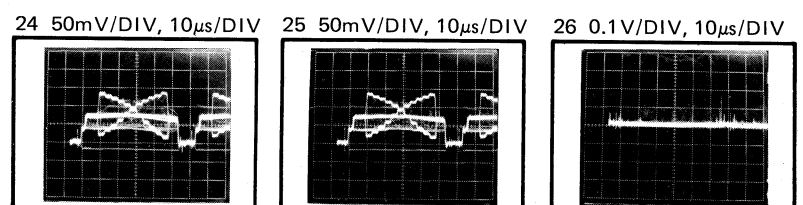
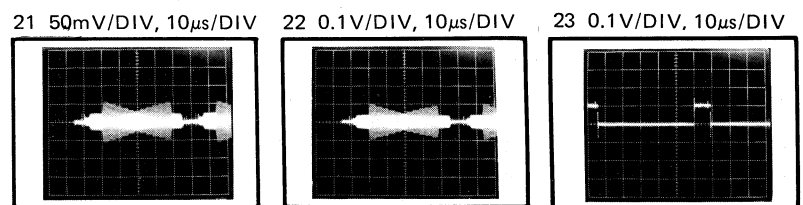
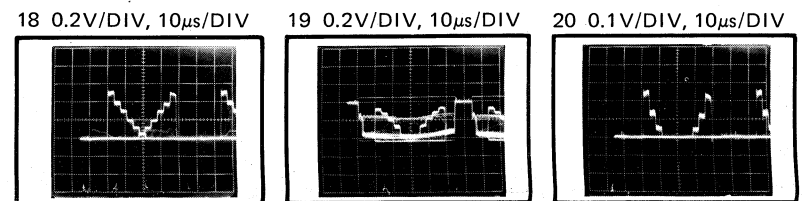


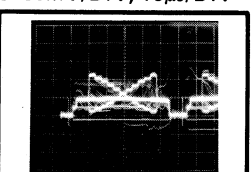
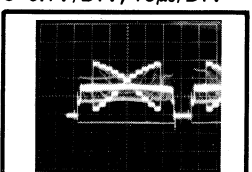
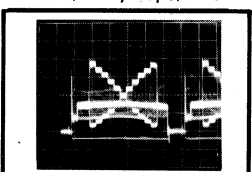
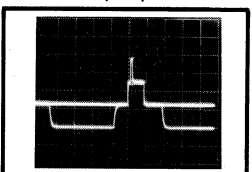
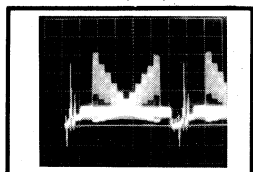
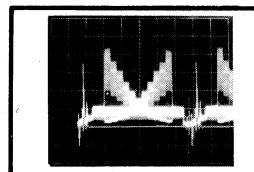
TO CORRECTION BOARD
 B11 (E1)
 TO SYNC-1 BOARD
 B12 (E2)
 TO SYNC-1 BOARD
 B11 (E1)



PROCESS BOARD

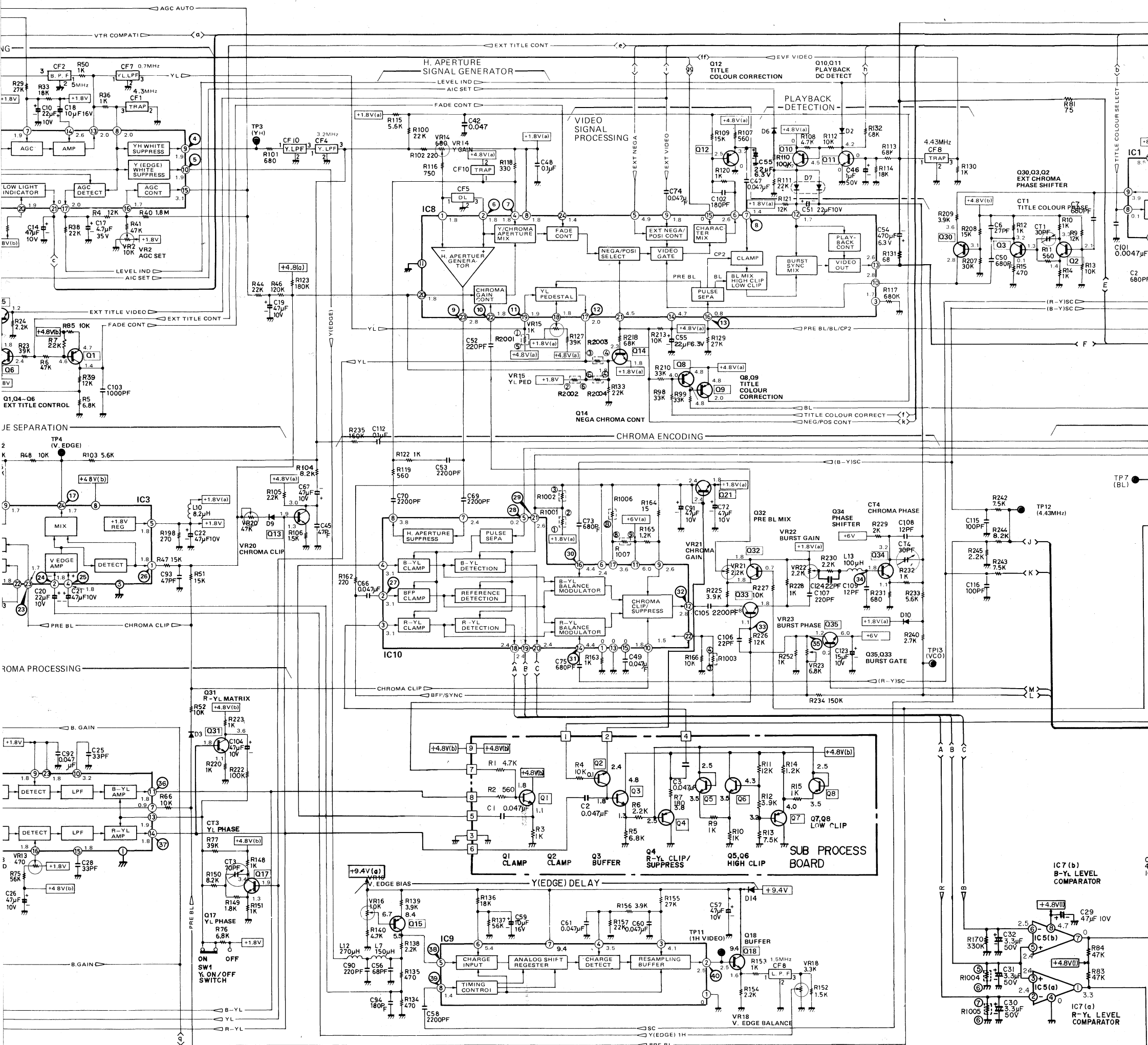
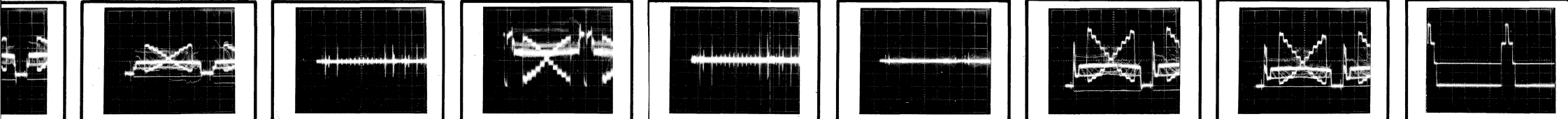
IC1	AN2560S	D5	Q14	2SD601-QRS	(Y)	B8
IC2	AN2110S	C5	Q15	2SB709-QRS	(A)	D6
IC3	AN2310S	C6	Q17	2SD601-QRS	(Y)	C7
IC4	AN2320S	C6, C7	Q18	2SD601-QRS	(Y)	D6
IC5	AN6914S	B7	Q21	2SC2404-CD	(U)	B7
IC7	NJM3414M	D7	Q28	2SD601-QRS	(Y)	C5
IC8	AN2210SA	C8	Q29	2SA1034-ST	(F)	D6
IC9	MN8037	D6	Q30	2SB709-QRS	(A)	D6
IC10	AN2410S	C7	Q31	2SC2404-CD	(U)	C7
IC13	MT0001	D8	Q32	2SD601-QRS	(Y)	B7
Q1	2SB709-QRS	(A)	Q33	2SC2404-CD	(U)	C7
Q2	2SC2404-CD	(U)	Q34	2SC2404-CD	(U)	C7
Q3	2SD601-QRS	(Y)	Q35	2SC2404-CD	(U)	C9
Q4	2SD601-QRS	(Y)	D1	MA151K	(MH)	C5
Q5	2SD601-QRS	(Y)	D2	MA151K	(MH)	B8
Q6	2SD601-QRS	(Y)	D3	MA151K	(MH)	C6
Q7	2SD638-QRS	D7	D6	MA151K	(MH)	B9
Q8	2SB709-QRS	(A)	D7	MA151WA	(MH)	C8
Q9	2SB709-QRS	(A)	D9	MA151K	(MH)	C7
Q10	2SB709-QRS	(A)	D10	MA151K	(MH)	D7
Q11	2SD601-QRS	(Y)	D13	MA151K	(MH)	
Q12	2SB709-QRS	(A)	D14	MA165		C7
Q13	2SD601-QRS	(Y)				



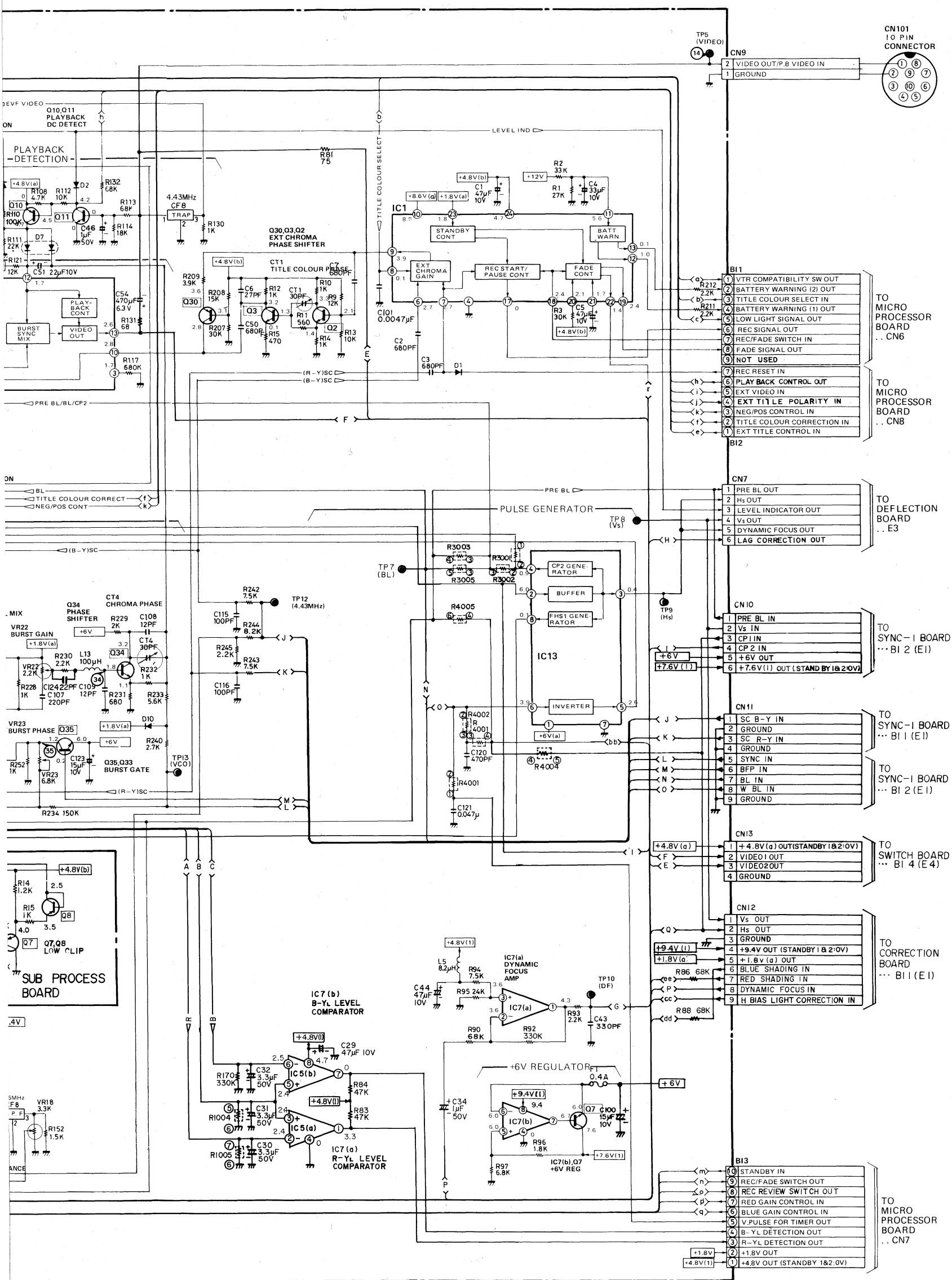
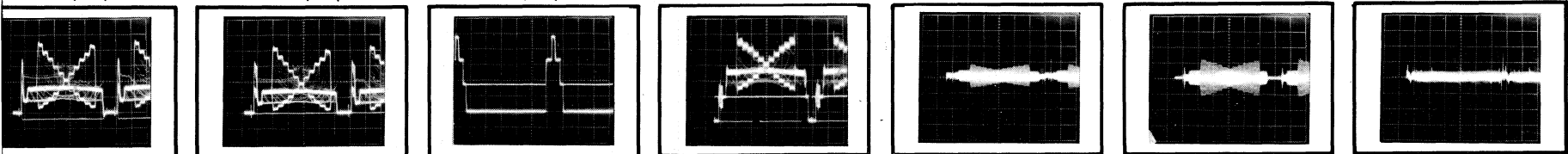


SCHEMATIC DIAGRAM OF PROCESS BOARD

1 1V/DIV, 10μs/DIV 2 1V/DIV, 10μs/DIV 3 1V/DIV, 10μs/DIV 4 1V/DIV, 10μs/DIV 5 1V/DIV, 10μs/DIV 6 50mV/DIV, 10μs/DIV 7 0.1V/DIV, 10μs/DIV 8 0.2V/DIV, 10μs/DIV 9 0.2V/DIV, 10μs/DIV 10 0.1V/DIV, 10μs/DIV 11 0.1V/DIV, 10μs/DIV 12 0.1V/DIV, 10μs/DIV 13 1V/DIV, 10μs/DIV



1 1V/DIV, 10μs/DIV 12 0.1V/DIV, 10μs/DIV 13 1V/DIV, 10μs/DIV 14 0.2V/DIV, 10μs/DIV 15 20V/DIV, 10μs/DIV 16 0.2V/DIV, 10μs/DIV 17 0.1V/DIV, 10μs/DIV



PROCESS BOARD

IC1	AN2560S	E9
IC2	AN2110S	E3, E4
IC3	AN2310S	C3, C4
IC4	AN2320S	B3, B4
IC5	AN6914S	A8
IC7	NJM3414M	A9, B9
IC8	AN2210SA	E6, E7
IC9	MN8037	A6
IC10	AN2410S	C6
IC13	MT0001	C9, C10
Q1	2SB709-QRS	(A) D4
Q2	2SC2404-CD	(U) E8
Q3	2SD601-QRS	(Y) E8
Q4	2SD601-QRS	(Y) D4
Q5	2SD601-QRS	(Y) D4
Q6	2SD601-QRS	(Y) D4
Q7	2SD638-QRS	A10
Q8	2SB709-QRS	(A) D7
Q9	2SB709-QRS	(A) D7
Q10	2SB709-QRS	(A) E7
Q11	2SD601-QRS	(Y) E8
Q12	2SB709-QRS	(A) E6
Q13	2SD601-QRS	(Y) C5
Q14	2SD601-QRS	(Y) D7
Q15	2SB709-QRS	(A) B6
Q17	2SD601-QRS	(Y) B5
Q18	2SD601-QRS	(Y) A7
Q21	2SC2404-CD	(U) C7, D7
Q28	2SD601-QRS	(Y) E2
Q29	2SA1034-ST	(F) D3
Q30	2SB709-QRS	(A) E8
Q31	2SC2404-CD	(U) B5
Q32	2SD601-QRS	(Y) C7
Q33	2SC2404-CD	(U) C7
Q34	2SC2404-CD	(U) C8
Q35	2SC2404-CD	(U) C9
D1	MA151K	(MH) D9
D2	MA151K	(MH) E8
D3	MA151K	(MH) B5
D6	MA151K	(MH) E7
D7	MA151WA	(MH) E7
D9	MA151K	(MH) C5
D10	MA151K	(MH) C8
D13	MA151K	(MH) B5
D14	MA165	B7

CAMERA REMOTE CONTROL BOARD

CONNECTORS:

- CN106 EVF/CONNECTION:** 91, 92, 93, 94, 95, 96, 97, 98
- SW002 NEAR:** 1, 2, 3, 4, 5, 6, 7, 8
- SW006 WIDE:** 1, 2, 3, 4, 5, 6, 7, 8
- SW004 REC:** 1, 2, 3, 4, 5, 6, 7, 8
- 13-PIN CONNECTOR:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13

COMPONENTS:

- Resistors:** R001 27K, R002 39K, R003 12K, R004 27K, R005 22K, R006 22K, R007 22K, R008 91K, R009 7.5K, R010 9.1K, R011 100K, R012 15K, R013 200, R014 200, R015 100K, R016 15K
- Capacitors:** C001 300PF, C002 50V, C003 1000PF, C004 1000PF, C005 680PF
- Switches:** SW001 FAR, SW002 NEAR, SW003 AUTO/MAN SELECT, SW004 REC, SW005 FADE, SW006 WIDE, SW007 TELE
- IC:** U001

FUNCTIONS:

- HD OUT:** 1, 2, 3, 4, 5, 6, 7, 8
- EVF V. DEF (+) IN:** 1, 2, 3, 4, 5, 6, 7, 8
- EVF V. DEF (-) IN:** 1, 2, 3, 4, 5, 6, 7, 8
- +7.6V OUT (STANDBY 1 & 2 : 0V):** 1, 2, 3, 4, 5, 6, 7, 8
- +4.8V OUT (STANDBY 1 & 2 : 0V):** 1, 2, 3, 4, 5, 6, 7, 8
- EVF VIDEO OUT:** 1, 2, 3, 4, 5, 6, 7, 8
- GROUND:** 1, 2, 3, 4, 5, 6, 7, 8
- FADE/REC SWITCH OUT:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
- HD IN:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
- EVF V DEF (+) IN:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
- EVF V DEF (-) IN:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
- +7.6V IN (STANDBY 1 & 2 : 0V):** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
- +4.8V IN (STANDBY 1 & 2 : 0V):** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
- EVF VIDEO IN:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
- +4.8V IN (STANDBY 1 & 2 : 0V):** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
- AUTO/MAN SELECT OUT:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
- ZOOM (TELE) OUT:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
- POWER FOCUS OUT:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
- ZOOM (WIDE) OUT:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
- GROUND:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13

The diagram illustrates the electrical connections for the CRT Deflection Coil assembly. It features two main components: the L102 CRT Deflection Coil and the CN104 CRT Socket.

Electrical Connections:

- Bit 1:** Connected to G3 OUT (Pin 1).
- Bit 2:** Connected to G2 OUT (Pin 6).
- Bit 3:** Connected to HK : +7.6V OUT (STANDBY1&2:0V) (Pin 4).
- Bit 4:** Connected to H : +4.8V OUT (STANDBY2:0V) (Pin 5).
- Bit 5:** Connected to G1 OUT (Pin 7).
- Bit 6:** Connected to G1 OUT (Pin 7).

Coil Connections:

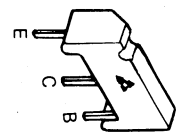
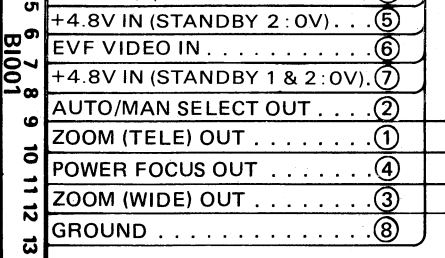
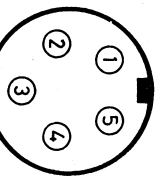
- GROUND:** Connected to the coil's ground terminal.
- EVF H.DEF OUT:** Connected to the coil's H.DEF OUT terminal.
- EVF V. DEF (+) OUT:** Connected to the coil's V. DEF (+) OUT terminal.
- EVF V. DEF (-) OUT:** Connected to the coil's V. DEF (-) OUT terminal.

Other Components:

- L102 CRT DEFLECTION COIL:** The central component of the assembly.
- CN104 CRT SOCKET:** The socket for the CRT, with pins 1 through 7 labeled.
- ANODE CAP:** The anode capacitor, connected to the coil's anode terminal.

CNIP	
8	EVF VIDEO IN
7	+4.8V IN (STANDBY2:0V)
6	+4.8V IN (STANDBY1&2:0V)
5	+7.6V IN (STANDBY1&2:0V)
4	GROUND
3	HD IN
2	EVF V. DEF (+) IN
1	EVF V. DEF (-) IN

CN105
CAMERA REMOTE
CONNECTOR



CAMERA REMOTE CONTROL BOARD

0001	2SD636-QR	A2
0002	2SD636-QR	A2
0003	2SB788-STU	A1
0004	2SD636-QR	B3
0005	2SD636-QR	B2

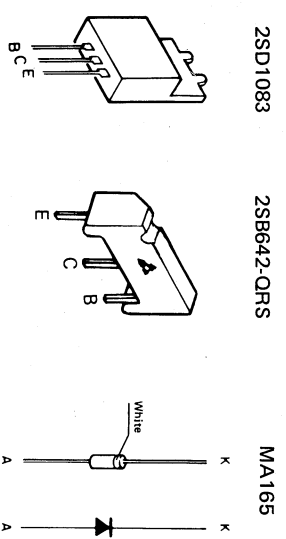
PRODUCT SAFETY NOTE

The shaded area on this schematic diagram incorporates special features important for protection from X-Radiation, fire and electrical shock hazards. When servicing it is essential that only manufacturer's specified parts be used for the critical components in the shaded areas of the schematic.

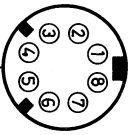
SCHEMATIC DIAGRAM OF ELECTRON

ELECTRONIC VIEWFINDER BOARD

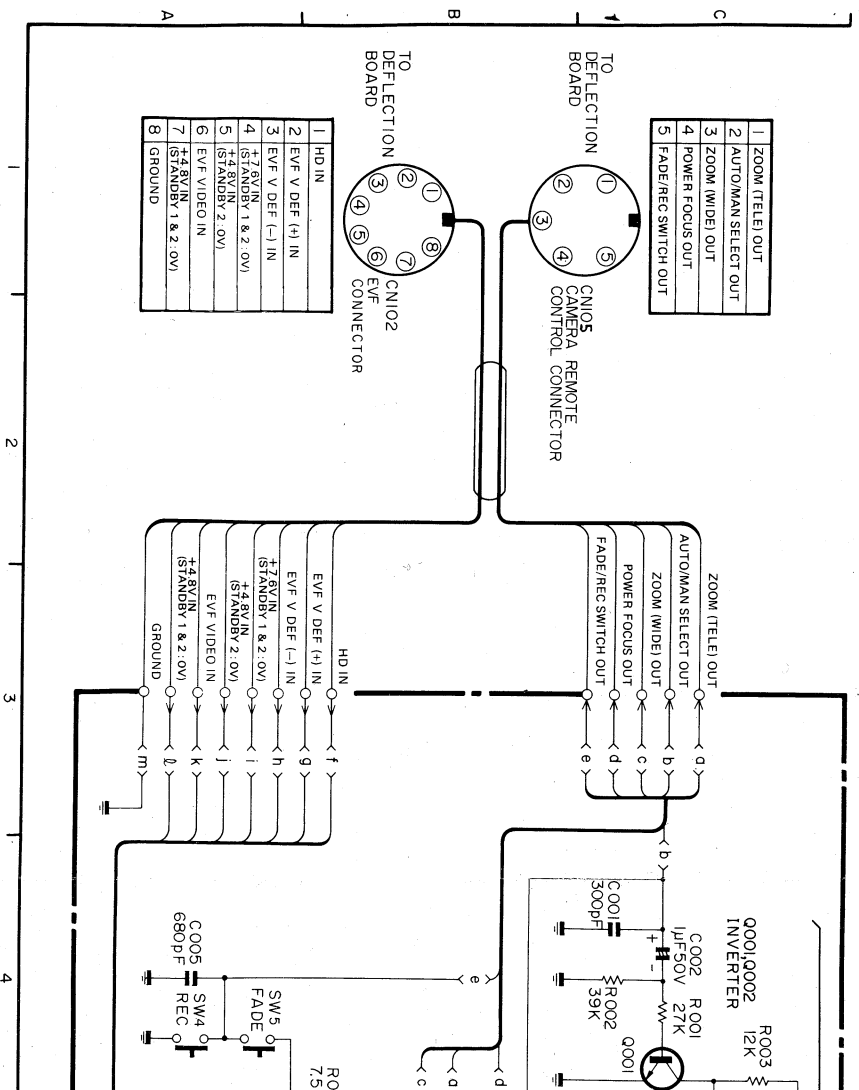
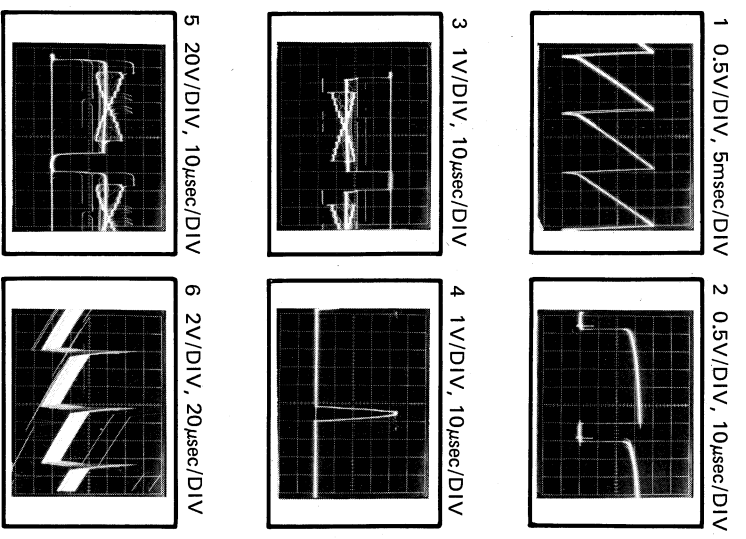
EVF BOARD	
Q1	2SD1083
Q2	2SB642-QRS
D1	MA165



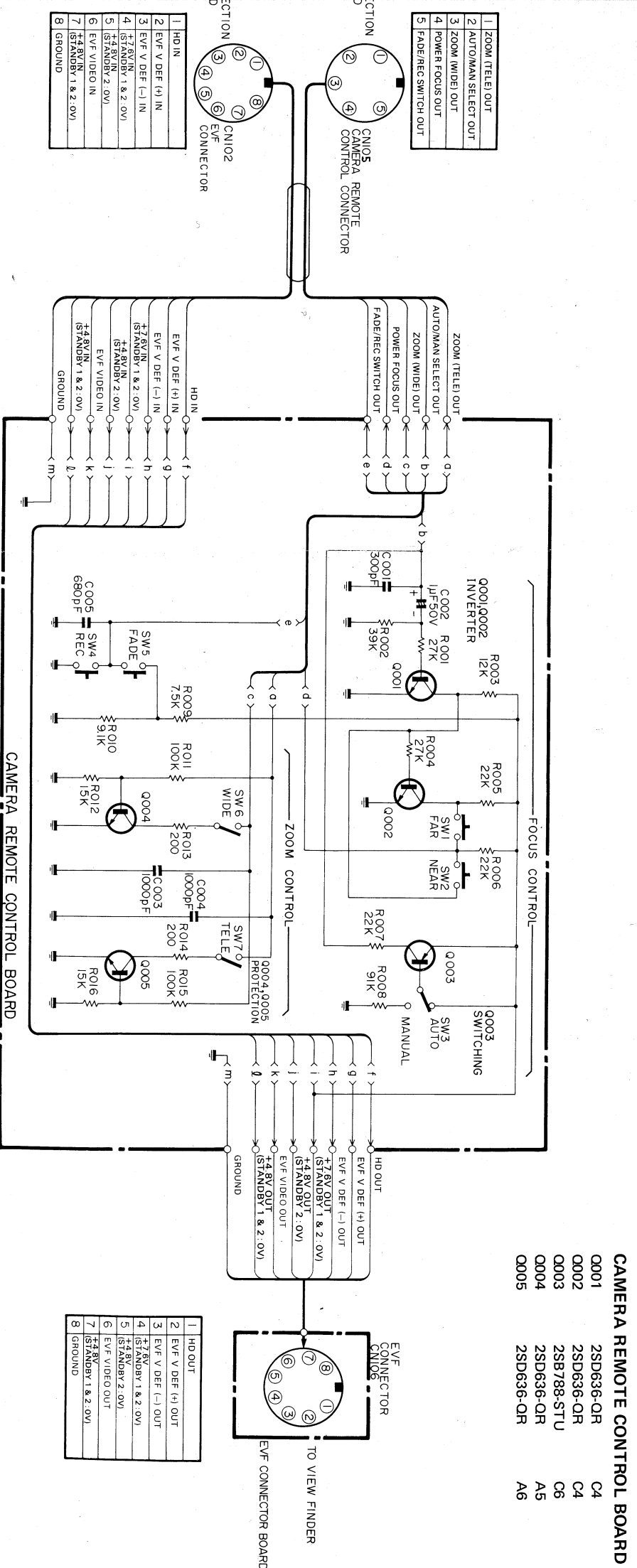
CN102
EVF CONNECTOR



CN1P	
1	EVF VIDEO IN
2	+4.8V IN (STANDBY 2: 0V)
3	+4.8V IN (STANDBY 1 & 2: 0V)
4	+7.6V IN (STANDBY 1 & 2: 0V)
5	GROUND
6	HD IN
7	EVF V. DEF (+) IN
8	EVF V. DEF (-) IN



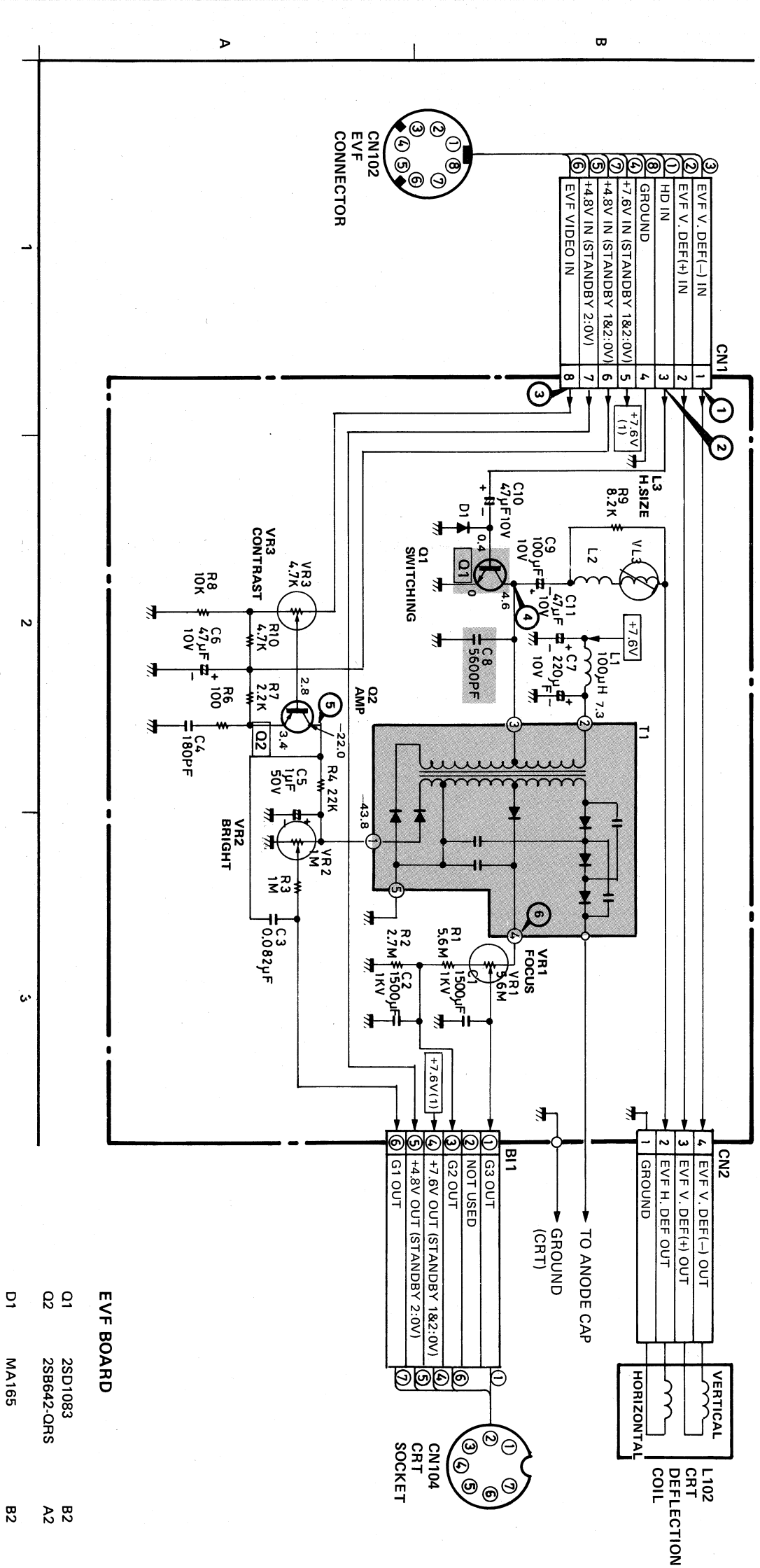
SCHEMATIC DIAGRAM OF CAMERA REMOTE CONTROL BOARD (WV-CR10)



SCHEMATIC DIAGRAM OF ELECTRONIC VIEWFINDER BOARD

important
on servicing
the critical

ELECTRONIC VIEWFINDER BOARD



Service Manual

Colour Video Cameras

Vol. 4

WVP-G1E/WVP-G1N

Replacement Parts List **Exploded View**

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Important Notice

REPLACEMENT PARTS LIST

- Components identified by Δ mark have special characteristics important for safety.
When replacing any of these components, use only manufacturer's specified parts.
- Components identified by $\circ$ mark are new parts used from this model.
- Complete printed circuit board assembly is not available as replacement part.

SYM-BOL NO.	PART NO.	DESCRIPTION	SYM-BOL NO.	PART NO.	DESCRIPTION
MISCELLANEOUS					
V101	S4165P	Pick-up Tube	M30	YF701312	Fiter Ball
X101	IR1R6X16R5SQ	IR Filter	M31	YF701501	Lock Knob
X102	YFXTALPF3230	Crystal Filter	M32	YF700005	Lock Spring
L101	YFELY18A214B	Deflection Coil	M35	YFV3CA0022A4	Coil Holder A
SW101	D2MQ1L	Micro Switch	M36	YFV3CA0025A4	Crystal Holder B
			M37	YFV3CA0024B4	Crystal Holder A
SW102	D2MQ1L-QRS	Micro Switch	M38	YFV4JA0040B4	Wave Washer (x2)
E101	YFBIASLITEG1	Bias Light Assy	M39	YFV1KA0012A4	Round Plain Washer
CN101	EMCTMA25C05V	10 pin VTR Connector	M40	YFV3FA0012B4	Backfocus Adjusting Ring
CN102	D8113N601	8 pin EVF Connector	M41	YFV2KA0051G1	Optical Coil Chassis
CN103	YFVIDSOKETG1	Pick-up Tube Socket	M42	YFV2HA0240A4	Shield Case for Preamplifier
			M43	YFV2HA0241B4	Coil Holder Shield Plate
CN105	YFD5113N600	Camera Remote Control Connector	M44	YFV2CA0076A4	Preamplifier Board Holder Shield Plate
CN106	EMCU10B4T34V	Camera Cable and VTR Connector	M45	YFV2HA0242A4	Bias Light Shield Plate A
CN107	EMCUSA21D04V	Lens Connector	M46	YFV2HA0243A4	Bias Light Shield Plate B
CN110	YWRM12BRD4P	4 pin EXT DC Connector	M47	YFV3CA0023A4	Coil Holder
CN111,112	YWBNC-R	BNC Connector	M48	YFV2HA0117A4	Shield Cover A for Microprocessor Board
M1	YFV5EA0124A1	Upper Cover	M49	YFV2HA0122A4	Shield Cover B
M2	$\circ$ YFV5EB0125A3	Handle Cover	M50	YFV2HA0098C4	Shield Cover C for EXT Mic Jack
M3	YFVAKA0164AS	Display Key Cover Assy	M51	YFV2EA0014A3	Hinge A (x3)
M4	YFV2SA0078A4	Mounting Angle for Circuit Board	M52	YFV2EA0015A3	Hinge B
M5	YFV2CA0024A4	Mounting Plate	M53	YFV2HA0099B4	Shield Cover D for Audio Board
			M55	$\circ$ YFV7QA0731A4	Main Label for WVP-G1E/EG/ES
M6	YFV4JA0043B4	Support Spring		$\circ$ YFV7QA0732A4	Main Label for WVP-G1EB
M7	YFV5MA0007B4	Mounting Shoe for EVF		$\circ$ YFV7QA0733A4	Main Label for WVP-G1N/A
M8	YFV6FA0019B3	Mounting Bracket for Shoe	M56	$\circ$ YFV2HA0237A3	Shield Case for EXT Sync
M9	YFV1FA0004A4	Mounting Nut for Shoe	M58	$\circ$ YFV2HA0239A3	Shield Cover for EXT Sync
M10	$\circ$ YFV9AA0231AN	EVF Connector Cover Assy	M59	$\circ$ YFV2FA0073A4	CC/WB Cover Cushion
			M62	YFV2HA0087A4	Shield Cover A for Deflection Board
M11	YFV3CA0026B4	Mounting Base for Microphone	M63	YFV2HA0088A4	Shield Cover B for Deflection Board
M12	$\circ$ YFV2SA0168 A3	Rear Chassis	M70	YFV2SA0167A4	Mounting Angle for Arm
M13	$\circ$ YFV5VA0036A3	Shoulder Pad			
M14	$\circ$ YFV9AA0229AN	Right Side Cover Assy for WVP-G1E Series	M100	YFV5EA0276A4	Rear Cover
	$\circ$ YFV9AA0232AN	Right Side Cover Assy for WVP-G1N Series	M101	YFV2SA0166A4	Mounting Angle
			M102	YFV1FA0017A4	Mounting Nut
M15	$\circ$ YFV9AA0230AN	Left Side Cover Assy for WVP-G1E Series	M103	YFV5WA0168A4	Blank Panel A
	$\circ$ YFV9AA0233AN	Left Side Cover Assy for WVP-G1N Series	M104	YFHP-6N	Holder for Capacitor
M16	$\circ$ YFV5EN0118A3	Left Bottom Cover	M105	YFV5WA0207A4	Blank Panel A
M18	YFV5EB0117A3	CC/WB Cover	M106	YFV7SA0169A4	Switch Label
M19	$\circ$ YFV5EA0173B2	Bottom Cover			
M20	YFV2WA0013A2	Shoulder Base	PREAMPLIFIER BOARD.		
M21	YFV5EB0115A3	Front Cover	PCB1	YFVPKA2002EA	Printed Circuit Board Assy
M22	YF701309	Body Mounting	Q1	2SK316-PQ	Transistor
M23	YF501050	Mounting Spring	Q2	2SA1022-CD	Transistor
M24	YF701301	Lens Base Assy	Q3	2SC2404-CD	Transistor
			Q4	2SA1022-CD	Transistor
M25	YF701354	W/B Filter Assy	Q5	2SD601-QRS	Transistor
M26	YF701355	C/C Filter Assy	D1	MA165	Diode
M27	YF701310	Earth Spring (x2)	R1	ERJ8GCSJ565	Carbon 5.6M ohms 1/8W
M28	YF701304	Filter Mounting Screws (x2)	R2	ER050CKG2704	Metal 2.7M ohms 1/2W
M29	YF701311	Filter Spring (x2)	R3	ERJ8GCSG431	Carbon 430 ohms 1/8W
			R4	ERJ8GCSG151	Carbon 150 ohms 1/8W
			R5	ERJ8GCSJ304	Carbon 300K ohms 1/8W
			R6	ERJ8GCSG622	Carbon 6.2K ohms 1/8W
			R7	ERJ8GCSG152	Carbon 1.5K ohms 1/8W
			R8	ERJ8GCSG183	Carbon 18K ohms 1/8W

SYM-BOL NO.	PART NO.	DESCRIPTION		SYM-BOL NO.	PART NO.	DESCRIPTION	
R9	ERJ8GCSG132	Carbon	1.3K ohms 1/8W	Q32	2SB814-RST	Transistor	
R10	ERJ8GCSG151	Carbon	150 ohms 1/8W	Q33	2SD814-QRS	Transistor	
R11	ERJ8GCSG273	Carbon	27K ohms 1/8W	Q40	2SD1030RST	Transistor	
R12	ERJ8GCSJ134	Carbon	130K ohms 1/8W	D1	EK14	Diode	
R13	ERJ8GCSG241	Carbon	240 ohms 1/8W	D2	HZ3BLL	Diode	
R14	ERJ8GCSG122	Carbon	1.2K ohms 1/8W	D3	MA151K	Diode	
R15	ERJ8GCSJ562	Carbon	5.6K ohms 1/8W	D4	MA165	Diode	
R17	ERJ8GCSJ224	Carbon	220K ohms 1/8W	D5	MA151K	Diode	
C1	YF426H273XKS	Ceramic	0.027 μ F 50V	D6	MA165	Diode	
C2	ECEA25Z4R7	Electrolytic	4.7 μ F 25V	D7	MA171	Diode	
C3	ECEA1AF470	Electrolytic	47 μ F 10V	D8	MA153	Diode	
C5,6	ECEA25Z3R3	Electrolytic	3.3 μ F 25V	R1	ERJ8GCSJ682	Carbon	6.8K ohms 1/8W
C8	YF426010SLDS	Ceramic	1 pF 50V	R2	ERJ8GCSJ102	Carbon	1K ohms 1/8W
C9	ECEA1ESS4R7	Electrolytic	4.7 μ F 25V	R3	ERJ8GCSG332	Carbon	3.3K ohms 1/8W
C10	YF426H273XKS	Ceramic	0.027 μ F 50V	R5	ERJ8GCSG303	Carbon	30K ohms 1/8W
C11	ECEA1AF470	Electrolytic	47 μ F 10V	R6	ERJ8GCSJ912	Carbon	9.1K ohms 1/8W
CT1	ECRHA030E11	Trimmer Capacitor	30 pF	R7	ERJ8GCSG222	Carbon	2.2K ohms 1/8W
L1	YFL270	Coil	27 μ H	R8	ERJ8GCSJ224	Carbon	220K ohms 1/8W
L2	YWL58R2J	Coil	8.2 μ H	R9	ERJ8GCSJ561	Carbon	560 ohms 1/8W
J1-3	ERJ8GCSJ0R00	Jumper Resistor		R10	ERJ8GCSG332	Carbon	3.3K ohms 1/8W
M60	YFV1KA0002A4	Washer		R11	ER0S2CKF3901	Metal	3.9K ohms 1/8W
DEFLECTION BOARD.				R12	ER0S2CKF5601	Metal	5.6K ohms 1/8W
PCB2	oYFVKY00G1E1A	Printed Circuit Board Assy		R13	ERJ8GCSG203	Carbon	20K ohms 1/8W
IC1	NJM2048MC	IC		R14	ERJ8GCSG113	Carbon	11K ohms 1/8W
IC2,3	NJM3415M	IC		R15	ERJ8GCSG133	Carbon	13K ohms 1/8W
IC4	NJM2903M	IC		R16	ERJ8GCSJ223	Carbon	22K ohms 1/8W
IC5	AN2510S	IC		R18	ERJ8GCSJ225	Carbon	2.2M ohms 1/8W
Q1	2SB837-CD	Transistor		R19	ERJ8GCSJ154	Carbon	150K ohms 1/8W
Q2	2SD601-QRS	Transistor		R20	ERJ8GCSJ104	Carbon	100K ohms 1/8W
Q3-5	2SB709-QRS	Transistor		R21	ERJ8GCSG391	Carbon	390 ohms 1/8W
Q6	2SD601-QRS	Transistor		R22	ERJ8GCSG303	Carbon	30K ohms 1/8W
Q7	2SD973-QRS	Transistor		R23	ERJ8GCSG512	Carbon	5.1K ohms 1/8W
Q8	2SB710-QRS	Transistor		R24	ERJ8GCSJ134	Carbon	130K ohms 1/8W
Q9	2SA684-QRS	Transistor		R25	ERJ8GCSJ563	Carbon	56K ohms 1/8W
Q11	2SD1030RST	Transistor		R26,27	ERJ8GCSJ102	Carbon	1K ohms 1/8W
Q12	2SC2404-CD	Transistor		R28	ERJ8GCSJ223	Carbon	22K ohms 1/8W
Q13	2SD1030RST	Transistor		R29	ERJ8GCSJ561	Carbon	560 ohms 1/8W
Q14	2SD601-QRS	Transistor		R30	ERJ8GCSG221	Carbon	220 ohms 1/8W
Q15	2SD602-QRS	Transistor		R31	ER0S2CKF18R0	Metal	18 ohms 1/8W
Q16	2SD1083	Transistor		R32	ERJ8GCSJ131	Carbon	130 ohms 1/8W
Q17	2SC2405STU	Transistor		R33	ERJ8GCSG181	Carbon	180 ohms 1/8W
Q18	2SD814-QRS	Transistor		R34	ERJ8GCSJ182	Carbon	1.8K ohms 1/8W
Q19,20	2SB814-QRS	Transistor		R35	ERSA39J332	Solid	3.3K ohms
Q21	2SD601-QRS	Transistor		R36	ERJ8GCSJ274	Carbon	270K ohms 1/8W
Q22	2SB814-RST	Transistor		R37	ERJ8GCSG221	Carbon	220 ohms 1/8W
Q24	2SB709-QRS	Transistor		R38	ERJ8GCSG333	Carbon	33K ohms 1/8W
Q25	2SD601-QRS	Transistor		R39	ERJ8GCSG153	Carbon	15K ohms 1/8W
Q26	2SD602-QRS	Transistor		R40	ER0S2CKF5103	Metal	510K ohms 1/8W
Q27	2SD1083	Transistor		R41	ERJ8GCSG391	Carbon	390 ohms 1/8W
Q28	2SB814-RST	Transistor		R42	ERJ8GCSG302	Carbon	3K ohms 1/8W
Q29	2SB793-RS	Transistor		R43	ERJ8GCSJ223	Carbon	22K ohms 1/8W
Q30,31	2SD601-QRS	Transistor		R44	ERJ8GCSJ222	Carbon	2.2K ohms 1/8W
				R45	ER0S2CKF33R0	Metal	33 ohms 1/8W
				R46	ERJ8GCSG512	Carbon	5.1K ohms 1/8W
				R47	ERJ8GCSJ223	Carbon	22K ohms 1/8W

SYM-BOL NO.	PART NO.	DESCRIPTION		SYM-BOL NO.	PART NO.	DESCRIPTION	
R48	ERJ8GCSJ103	Carbon	10K ohms 1/8W	VR7	YFH0521A47K	Variable Resistor	47K ohms
R49	ERJ8GCSG333	Carbon	33K ohms 1/8W	VR8,9	EVN8ACA00BQ4	Variable Resistor	47K ohms
R50	ERJ8GCSJ223	Carbon	22K ohms 1/8W	VR10	YFH0521A47K	Variable Resistor	47K ohms
R51	ERJ8GCSG332	Carbon	3.3K ohms 1/8W	VR11	YFH0521A100	Variable Resistor	100 ohms
R52	ERJ8GCSG153	Carbon	15K ohms 1/8W	VR12	EVN8ACA00BQ3	Variable Resistor	4.7K ohms
R53,54	ERJ8GCSJ823	Carbon	82K ohms 1/8W	VR13	EVN8ACA00B14	Variable Resistor	10K ohms
R55	ERJ8GCSG273	Carbon	27K ohms 1/8W	VR14	YFH0651A2R2M	Variable Resistor	2.2M ohms
R56	ERJ8GCSG333	Carbon	33K ohms 1/8W	Z1	EVM78GA00116	Block Resistor	
R57	ERJ8GCSJ184	Carbon	180K ohms 1/8W	C1	ECEA1AF470	Electrolytic	47 μ F 10V
R58,59	ERJ8GCSJ223	Carbon	22K ohms 1/8W	C2	ECEA1EF100	Electrolytic	10 μ F 25V
R60	ERJ8GCSJ682	Carbon	6.8K ohms 1/8W	C3	YF426102XMS	Ceramic	1000 pF 50V
R61	ERJ8GCSJ222	Carbon	2.2K ohms 1/8W	C5	ECEA1EF330	Electrolytic	33 μ F 25V
R62	ERJ8GCSJ823	Carbon	82K ohms 1/8W	C6	ECEA1AS221	Electrolytic	220 μ F 10V
R63	ERJ8GCSJ624	Carbon	620K ohms 1/8W	C7	YF426331CHJS	Ceramic	330 pF 50V
R64	ERJ8GCSG153	Carbon	15K ohms 1/8W	C8	ECEA1ASS470	Electrolytic	47 μ F 10V
R65	ERJ8GCSJ683	Carbon	68K ohms 1/8W	C9	ECEA1AF101	Electrolytic	100 μ F 10V
R66	ERJ8GCSJ104	Carbon	100K ohms 1/8W	C10	ECEA0JSS101	Electrolytic	100 μ F 6.3V
R67	ERJ8GCSJ330	Carbon	33 ohms 1/8W	C11	ECEA1ASS470	Electrolytic	47 μ F 10V
R68	ERJ8GCSG151	Carbon	150 ohms 1/8W	C12	ECEA1ESS4R7	Electrolytic	4.7 μ F 25V
R69	ERJ8GCSG332	Carbon	3.3K ohms 1/8W	C13	ECEA1HSS2R2	Electrolytic	2.2 μ F 50V
R71	ERD10TJ3R3	Carbon	3.3 ohms 1/8W	C14	YF426224XMS	Ceramic	0.22 μ F 50V
R72	ERJ8GCSG560	Carbon	56 ohms 1/8W	C15	ECKF1H102KB	Ceramic	1000 pF 50V
R73	ERJ8GCSJ102	Carbon	1K ohms 1/8W	C16	ECEA1ASS470	Electrolytic	47 μ F 10V
R74	ERJ8GCSG512	Carbon	5.1K ohms 1/8W	C17	ECEA1ASS470	Electrolytic	47 μ F 10V
R75	ERJ8GCSJ623	Carbon	62K ohms 1/8W	C18	ECEA1AF101	Electrolytic	100 μ F 10V
R76	ERJ8GCSJ222	Carbon	2.2K ohms 1/8W	C19	ECQV1H124JZ	Plastic	0.1 μ F 50V
R77	ERJ8GCSJ561	Carbon	560 ohms 1/8W	C20	ECQP1301JZ	Plastic	300 pF 100V
R79	ERJ8GCSJ334	Carbon	330K ohms 1/8W	C21	YF426561SLJS	Ceramic	560 pF 50V
R80	ERJ8GCSG512	Carbon	5.1K ohms 1/8W	C22	ECEA1ASS470	Electrolytic	47 μ F 10V
R81	ERJ8GCSG242	Carbon	2.4K ohms 1/8W	C23	ECQK1104JG	Plastic	0.1 μ F 100V
R82	ERJ8GCSG333	Carbon	33K ohms 1/8W	C24	YF426473XMS	Ceramic	0.047 μ F 50V
R83	ERJ8GCSJ562	Carbon	5.6K ohms 1/8W	C25	YF426102XMS	Ceramic	1000 pF 50V
R84	ERJ8GCSG271	Carbon	270 ohms 1/8W	C26	ECEA1ASS470	Electrolytic	47 μ F 10V
R85	ERJ8GCSG151	Carbon	150 ohms 1/8W	C27	ECEA1ESS4R7	Electrolytic	4.7 μ F 25V
R87,89	ERJ8GCSG273	Carbon	27K ohms 1/8W	C28	YF426272XMS	Ceramic	2700 pF 50V
R88	ERJ8GCSJ333	Carbon	33K ohms 1/8W	C29	YF426473XMS	Ceramic	0.047 μ F 50V
R90	ERJ8GCSJ105	Carbon	1M ohms 1/8W	C30	ECEA1ASS470	Electrolytic	47 μ F 10V
R91	ERJ8GCSJ225	Carbon	2.2M ohms 1/8W	C31	ECEA2AS010	Electrolytic	1 μ F 100V
R92	ERJ8GCSG271	Carbon	270 ohms 1/8W	C33	ECEA0JSS221	Electrolytic	220 μ F 6.3V
R93	ERJ8GCSG332	Carbon	3.3K ohms 1/8W	C34	ECEA1ASS470	Electrolytic	47 μ F 10V
R94,95	ERJ8GCSJ222	Carbon	2.2K ohms 1/8W	C35	ECEA1AF470	Electrolytic	47 μ F 10V
R96	ERJ8GCSJ3R9	Carbon	3.9 ohms 1/8W	C36	ECQV1H824JZ	Plastic	0.82 μ F 50V
R98	ERJ8GCSJ102	Carbon	1K ohms 1/8W	C37	ECQP1152JZ	Plastic	1500 pF 100V
R99	ERJ8GCSG392	Carbon	3.9K ohms 1/8W	C38	ECEA1CSS100	Electrolytic	10 μ F 16V
R100	ERJ8GCSJ472	Carbon	4.7K ohms 1/8W	C39	YF426223XKS	Ceramic	0.022 μ F 50V
R101	ERJ8GCSJ225	Carbon	2.2M ohms 1/8W	C40	ECQV1H224JZ	Plastic	0.22 μ F 50V
R103	ERJ8GCSJ682	Carbon	6.8K ohms 1/8W	C41	YF426102XMS	Ceramic	1000 pF 50V
R104	ERJ8GCSJ2R2	Carbon	2.2 ohms 1/8W	C42	YF426911CHJS	Ceramic	910 pF 50V
R105	ERDS1TJ270	Carbon	27 ohms 1/2W	C43	ECEA1ESS4R7	Electrolytic	4.7 μ F 25V
R106	ERD25FJ180	Carbon	18 ohms 1/2W	C44	ECEA1ASS470	Electrolytic	47 μ F 10V
VR1	EVN8ACA00BY4	Variable Resistor	33K ohms	C45	ECEA1ASS221	Electrolytic	220 μ F 10V
VR2	EVM8AGA00B12	Variable Resistor	100 ohms	C46	ECQP1432JZ	Plastic	4300 pF 100V
VR3	YFH0521A10K	Variable Resistor	10K ohms	C47	ECEA2AS3R3	Electrolytic	3.3 μ F 100V
VR4	EVN8ACA00BC3	Variable Resistor	1.5K ohms	C48	ECEA2HSS3R3	Electrolytic	3.3 μ F 100V
VR5	YFH0621A150K	Variable Resistor	150K ohms	C50	DE979B152K	Ceramic	1500 pF 50V
VR6	EVN8ACA00BQ3	Variable Resistor	4.7K ohms				

SYM-BOL NO.	PART NO.	DESCRIPTION		SYM-BOL NO.	PART NO.	DESCRIPTION	
C51	ECQE2473KS	Plastic	0.047 μ F 250V	Q31	2SC2404-CD	Transistor	
C52	ECEA1AF470	Electrolytic	47 μ F 10V	Q32	2SD601-QRS	Transistor	
C53	ECQE2473KS	Plastic	0.047 μ F 250V	Q33-35	2SC2404-CD	Transistor	
C54	YF426272XMS	Ceramic	2700 pF 50V	D1-3	MA151K	Diode	
C57	YF426473XMS	Ceramic	0.047 μ F 50V	D6	MA151K	Diode	
C60	ECEA1CN100S	Electrolytic	10 μ F 16V	D7	MA151WA	Diode	
C61	ECEA1HN010S	Electrolytic	1 μ F 50V	D9,10	MA151K	Diode	
L1	YFPC470K	Coil	47 μ H	D13	MA151K	Diode	
L2	YFPF331K	Coil	330 μ H	D14	MA165	Diode	
L3	YFPC470K	Coil	47 μ H	R1	ERJ8GCSG273	Carbon	27K ohms 1/8W
L4	YFLH103JZ	Coil	10 mH	R2	ERJ8GCSG333	Carbon	33K ohms 1/8W
L5	YFVL233	Coil	23 mH	R3	ERJ8GCSG303	Carbon	30K ohms 1/8W
L6	YFVC101J	Coil	100 μ H	R4	ERJ8GCSG123	Carbon	12K ohms 1/8W
T1	ECXC0075	Flyback Transformer		R5	ERJ8GCSJ682	Carbon	6.8K ohms 1/8W
T2	YFVL801	Flyback Transformer		R6	ERJ8GCSJ473	Carbon	47K ohms 1/8W
F1	ICPF25	Current Fuse 1A		R7	ERJ8GCSJ223	Carbon	22K ohms 1/8W
J20	ERJ8GCS0R00	Jumper Resistor		R9	ERJ8GCSG123	Carbon	12K ohms 1/8W
CN1-JM	EMCS0650Z	6 pin Jack Male		R10	ERJ8GCSJ102	Carbon	1K ohms 1/8W
CN2-JM	EMCS0850Z	8 pin Jack Male		R11	ERJ8GCSJ561	Carbon	560 ohms 1/8W
CN3-JM	EMCS0550Z	5 pin Jack Male		R12	ERJ8GCSJ102	Carbon	1K ohms 1/8W
CN4,5-JM	EMCS0250Z	2 pin Jack Male		R13	ERJ8GCSJ103	Carbon	10K ohms 1/8W
CN6-JM	EMCS1050Z	10 pin Jack Male		R14	ERJ8GCSJ102	Carbon	1K ohms 1/8W
CN7-JM	EMCS0550Z	5 pin Jack Male		R15	ERJ8GCSJ471	Carbon	470 ohms 1/8W
CN8-JM	EMCS0250Z	2 pin Jack Male		R17	ERJ8GCSG123	Carbon	12K ohms 1/8W
M61	YFV2HA0086A4	Shield Case		R18,19	ERJ8GCSG332	Carbon	3.3K ohms 1/8W
PROCESS BOARD.				R21	ERJ8GCSG392	Carbon	3.9K ohms 1/8W
PCB3	o YFVKY00G1E3A	Printed Circuit Board Assy		R22	ERJ8GCSJ222	Carbon	2.2K ohms 1/8W
IC1	AN2560S	IC		R23	ERJ8GCSJ393	Carbon	39K ohms 1/8W
IC2	AN2110S	IC		R24	ERJ8GCSJ222	Carbon	2.2K ohms 1/8W
IC3	AN2310S	IC		R25	ERJ8GCSJ184	Carbon	180K ohms 1/8W
IC4	AN2320S	IC		R26	ERJ8GCSJ563	Carbon	56K ohms 1/8W
IC5	AN6914S	IC		R27	ERJ8GCSG911	Carbon	910 ohms 1/8W
IC7	NJM3414M	IC		R28	ERJ8GCSJ561	Carbon	560 ohms 1/8W
IC8	AN2210SA	IC		R29	ERJ8GCSG273	Carbon	27K ohms 1/8W
IC9	MN8037	LSI		R30	ERJ8GCSJ563	Carbon	56K ohms 1/8W
IC10	AN2410S	IC		R31,32	ERJ8GCSJ102	Carbon	1K ohms 1/8W
IC13	MT0001	IC		R33	ERJ8GCSG183	Carbon	18K ohms 1/8W
Q1	2SB709-QRS	Transistor		R34	ERJ8GCSG821	Carbon	820 ohms 1/8W
Q2	2SC2404-CD	Transistor		R35	ERJ8GCSG512	Carbon	5.1K ohms 1/8W
Q3-6	2SD601-QRS	Transistor		R36	ERJ8GCSJ102	Carbon	1K ohms 1/8W
Q7	2SD638-QRS	Transistor		R37	ERJ8GCSJ563	Carbon	56K ohms 1/8W
Q8-10	2SB709-QRS	Transistor		R38	ERJ8GCSJ223	Carbon	22K ohms 1/8W
Q11	2SD601-QRS	Transistor		R39	ERJ8GCSG123	Carbon	12K ohms 1/8W
Q12	2SB709-QRS	Transistor		R40	ERJ8GCSJ185	Carbon	1.8M ohms 1/8W
Q13,14	2SD601-QRS	Transistor		R41	ERJ8GCSJ473	Carbon	47K ohms 1/8W
Q15	2SB709-QRS	Transistor		R42	ERJ8GCSJ154	Carbon	150K ohms 1/8W
Q17,18	2SD601-QRS	Transistor		R43	ERJ8GCSJ683	Carbon	68K ohms 1/8W
Q21	2SC2404-CD	Transistor		R44	ERJ8GCSJ223	Carbon	22K ohms 1/8W
Q28	2SD601-QRS	Transistor		R46	ERJ8GCSJ124	Carbon	120K ohms 1/8W
Q29	2SA1034-ST	Transistor		R47	ERJ8GCSG153	Carbon	15K ohms 1/8W
Q30	2SB709-QRS	Transistor		R48	ERJ8GCSJ103	Carbon	10K ohms 1/8W
				R49,50	ERJ8GCSJ102	Carbon	1K ohms 1/8W
				R51	ERJ8GCSG153	Carbon	15K ohms 1/8W
				R52	ERJ8GCSJ103	Carbon	10K ohms 1/8W
				R53	ERJ8GCSG431	Carbon	430 ohms 1/8W

SYM-BOL NO.	PART NO.	DESCRIPTION		SYM-BOL NO.	PART NO.	DESCRIPTION	
R54	ERJ8GCSJ561	Carbon	560 ohms 1/8W	R129	ERJ8GCSG273	Carbon	27K ohms 1/8W
R55	ERJ8GCSJ274	Carbon	270K ohms 1/8W	R130	ERJ8GCSJ102	Carbon	1K ohms 1/8W
R56	ERJ8GCSJ222	Carbon	2.2K ohms 1/8W	R131	ERJ8GCSJ680	Carbon	68 ohms 1/8W
R57	ERJ8GCSJ102	Carbon	1K ohms 1/8W	R132	ERJ8GCSJ683	Carbon	68K ohms 1/8W
R59	ERJ8GCSJ152	Carbon	1.5K ohms 1/8W	R133	ERJ8GCSJ223	Carbon	22K ohms 1/8W
R63,64	ERJ8GCSG333	Carbon	33K ohms 1/8W	R134,135	ERJ8GCSJ471	Carbon	470 ohms 1/8W
R65	ERJ8GCSJ304	Carbon	300K ohms 1/8W	R136	ERJ8GCSG183	Carbon	18K ohms 1/8W
R66	ERJ8GCSJ103	Carbon	10K ohms 1/8W	R137	ERJ8GCSJ563	Carbon	56K ohms 1/8W
R70	ERJ8GCSJ223	Carbon	22K ohms 1/8W	R138	ERJ8GCSJ222	Carbon	2.2K ohms 1/8W
R71	ERJ8GCSJ823	Carbon	82K ohms 1/8W	R139	ERJ8GCSG392	Carbon	3.9K ohms 1/8W
R72	ERJ8GCSJ223	Carbon	22K ohms 1/8W	R140	ERJ8GCSJ472	Carbon	4.7K ohms 1/8W
R73	ERJ8GCSJ472	Carbon	4.7K ohms 1/8W	R148	ERJ 8 GCSJ102	Carbon	1K ohms 1/8W
R74	ERJ8GCSJ185	Carbon	1.8M ohms 1/8W	R149	ERJ8GCSJ182	Carbon	1.8K ohms 1/8W
R75	ERJ8GCSJ563	Carbon	56K ohms 1/8W	R150	ERJ8GCSJ822	Carbon	8.2K ohms 1/8W
R76	ERJ8GCSJ682	Carbon	6.8K ohms 1/8W	R151	ERJ8GCSJ102	Carbon	1K ohms 1/8W
R77	ERJ8GCSJ393	Carbon	39K ohms 1/8W	R152	ERJ8GCSJ152	Carbon	1.5K ohms 1/8W
R78	ERJ8GCSG392	Carbon	3.9K ohms 1/8W	R153	ERJ8GCSJ102	Carbon	1K ohms 1/8W
R79	ERJ8GCSJ334	Carbon	330K ohms 1/8W	R154	ERJ8GCSJ222	Carbon	2.2K ohms 1/8W
R80	ERJ8GCSG681	Carbon	680 ohms 1/8W	R155	ERJ8GCSG273	Carbon	27K ohms 1/8W
R81	ERJ8GCSJ750	Carbon	75 ohms 1/8W	R156	ERJ8GCSG392	Carbon	3.9K ohms 1/8W
R83,84	ERJ8GCSJ473	Carbon	47K ohms 1/8W	R157	ERJ8GCSJ223	Carbon	22K ohms 1/8W
R85	ERJ8GCSG103	Carbon	10K ohms 1/8W	R162	ERJ8GCSG221	Carbon	220 ohms 1/8W
R86,88	ERJ8GCSJ683	Carbon	68K ohms 1/8W	R163	ERJ8GCSJ102	Carbon	1K ohms 1/8W
R90	ERJ8GCSJ683	Carbon	68K ohms 1/8W	R164	ERJ8GCSJ150	Carbon	15 ohms 1/8W
R92	ERJ8GCSJ334	Carbon	330K ohms 1/8W	R165	ERJ8GCSG122	Carbon	1.2K ohms 1/8W
R93	ERJ8GCSJ222	Carbon	2.2K ohms 1/8W	R166	ERJ8GCSJ103	Carbon	10K ohms 1/8W
R94	ERJ8GCSG752	Carbon	7.5K ohms 1/8W	R170	ERJ8GCSJ334	Carbon	330K ohms 1/8W
R95	ERJ8GCSG243	Carbon	24K ohms 1/8W	R198	ERJ8GCSG271	Carbon	270 ohms 1/8W
R96	ERJ8GCSG182	Carbon	1.8K ohms 1/8W	R202	ERJ8GCSG332	Carbon	3.3K ohms 1/8W
R97	ERJ8GCSG682	Carbon	6.8K ohms 1/8W	R203	ERJ8GCSJ102	Carbon	1K ohms 1/8W
R98,99	ERJ8GCSG333	Carbon	33K ohms 1/8W	R204	ERJ8GCSJ470	Carbon	47 ohms 1/8W
R100	ERJ8GCSJ223	Carbon	22K ohms 1/8W	R205	ERJ8GCSJ103	Carbon	10K ohms 1/8W
R101	ERJ8GCSG681	Carbon	680 ohms 1/8W	R207	ERJ8GCSG303	Carbon	30K ohms 1/8W
R102	ERJ8GCSG221	Carbon	220 ohms 1/8W	R208	ERJ8GCSG153	Carbon	15K ohms 1/8W
R103	ERJ8GCSJ562	Carbon	5.6K ohms 1/8W	R209	ERJ8GCSG392	Carbon	3.9K ohms 1/8W
R104	ERJ8GCSJ223	Carbon	22K ohms 1/8W	R210	ERJ8GCSG333	Carbon	33K ohms 1/8W
R105	ERJ8GCSJ222	Carbon	2.2K ohms 1/8W	R211,212	ERJ8GCSJ222	Carbon	2.2K ohms 1/8W
R106	ERJ8GCSJ152	Carbon	1.5K ohms 1/8W	R213	ERJ8GCSJ103	Carbon	10K ohms 1/8W
R107	ERJ8GCSJ561	Carbon	560 ohms 1/8W	R218	ERJ8GCSJ683	Carbon	68K ohms 1/8W
R108	ERJ8GCSJ472	Carbon	4.7K ohms 1/8W	R220	ERJ8GCSJ102	Carbon	1K ohms 1/8W
R109	ERJ8GCSG153	Carbon	15K ohms 1/8W	R222	ERJ8GCSJ104	Carbon	100K ohms 1/8W
R110	ERJ8GCSJ104	Carbon	100K ohms 1/8W	R223	ERJ8GCSJ102	Carbon	1K ohms 1/8W
R111	ERJ8GCSJ223	Carbon	22K ohms 1/8W	R224	ERJ8GCSJ224	Carbon	220K ohms 1/8W
R112	ERJ8GCSJ103	Carbon	10K ohms 1/8W	R225	ERJ8GCSG392	Carbon	3.9K ohms 1/8W
R113	ERJ8GCSJ683	Carbon	68K ohms 1/8W	R226	ERJ8GCSG123	Carbon	12K ohms 1/8W
R114	ERJ8GCSG183	Carbon	18K ohms 1/8W	R227	ERJ8GCSJ103	Carbon	10K ohms 1/8W
R115	ERJ8GCSJ562	Carbon	5.6K ohms 1/8W	R228	ERJ8GCSJ102	Carbon	1K ohms 1/8W
R116	ERJ8GCSJ751	Carbon	750 ohms 1/8W	R229	ERJ8GCSG202	Carbon	2K ohms 1/8W
R117	ERJ8GCSJ684	Carbon	680 ohms 1/8W	R230	ERJ8GCSJ222	Carbon	2.2K ohms 1/8W
R118	ERJ8GCSJ331	Carbon	330 ohms 1/8W	R231	ERJ8GCSG681	Carbon	680 ohms 1/8W
R119	ERJ8GCSJ561	Carbon	560 ohms 1/8W	R232	ERJ8GCSJ102	Carbon	1K ohms 1/8W
R120	ERJ8GCSJ102	Carbon	1K ohms 1/8W	R233	ERJ8GCSJ562	Carbon	5.6K ohms 1/8W
R121	ERJ8GCSG123	Carbon	12K ohms 1/8W	R234	ERJ8GCSJ154	Carbon	150K ohms 1/8W
R122	ERJ8GCSJ102	Carbon	1K ohms 1/8W	R235	ERJ8GCSJ164	Carbon	160K ohms 1/8W
R127	ERJ8GCSJ393	Carbon	39K ohms 1/8W	R240	ERJ8GCSG272	Carbon	2.7K ohms 1/8W

SYM-BOL NO.	PART NO.	DESCRIPTION		SYM-BOL NO.	PART NO.	DESCRIPTION	
R242,243	ERJ8GCSG752	Carbon	7.5K ohms 1/8W	C47	YF426473XMS	Ceramic	0.047 μ F 50V
R244	ERJ8GCSJ822	Carbon	8.2K ohms 1/8W	C48	YF426104DMS	Ceramic	0.1 μ F 50V
R245	ERJ8GCSJ222	Carbon	2.2K ohms 1/8W	C49	YF426473XMS	Ceramic	0.047 μ F 50V
R252	ERJ8GCSJ102	Carbon	1K ohms 1/8W				
VR1	EVN8ACA00BE4	Variable Resistor	22K ohms	C50	YF426681SLKS	Ceramic	680 pF 50V
VR2,3	EVN8ACA00B14	Variable Resistor	10K ohms	C51	ECEA1ASS220	Electrolytic	22 μ F 10V
VR4	EVN8ACA00BY3	Variable Resistor	3.3K ohms	C52	YF426221SLKS	Ceramic	220 pF 50V
VR5	EVN8ACA00BE3	Variable Resistor	2.2K ohms	C53	YF426222XKS	Ceramic	2200 pF 50V
VR12	EVN8ACA00B14	Variable Resistor	10K ohms	C54	ECEA0JSS471	Electrolytic	470 μ F 6.3V
VR13	YWH0651A470	Variable Resistor	470 ohms	C55	ECSF0JE226	Tantalum	22 μ F 6.3V
VR14	YFH0621A680X	Variable Resistor	680 ohms	C56	YF426680CHJS	Ceramic	68 pF 50V
VR15	YFH0521A1K	Variable Resistor	1K ohms	C57	ECEA1ASS470	Electrolytic	47 μ F 10V
VR16	YFH0521A10K	Variable Resistor	10K ohms	C58	YF426222XMS	Ceramic	2200 pF 50V
VR18	EVN8ACA00BY3	Variable Resistor	3.3K ohms	C59	ECEA1CSS100	Electrolytic	10 μ F 16V
VR20	YFH0521A47K	Variable Resistor	47K ohms	C60,61	YF426473XMS	Ceramic	0.047 μ F 50V
VR21,22	YFH0521A2R2K	Variable Resistor	2.2K ohms	C66	YF426473XMS	Ceramic	0.047 μ F 50V
VR23	YFH0521A6R8K	Variable Resistor	6.8K ohms	C67	ECEA1ASS470	Electrolytic	47 μ F 10V
BVR1,2	YFH1622A001	Block Variable Resistor		C69,70	YF426222XMS	Ceramic	2200 pF 50V
Z1	EXBD87321JW	Block Resistor		C71	ECEA1ASS470	Electrolytic	47 μ F 10V
Z2	EXBD85322S	Block Resistor		C72	ECEA1ASS470	Electrolytic	47 μ F 10V
Z3	EXBF5L324J	Block Resistor		C73	YF426681SLKS	Ceramic	680 pF 50V
Z4	EXBF6L323J	Block Resistor		C74	YF426473XMS	Ceramic	0.047 μ F 50V
C1	ECSF1AE476	Electrolytic	47 μ F 10V	C75	YF426681SLKS	Ceramic	680 pF 50V
C2,3	YF426681SLKS	Ceramic	680 pF 50V	C88	YF426104DMS	Ceramic	0.1 μ F 50V
C4	ECEA1ASS330	Electrolytic	33 μ F 10V	C89	YF426270CHJS	Ceramic	27 pF 50V
C5	ECEA10Z47	Electrolytic	47 μ F 10V	C90	YF426221SLKS	Ceramic	220 pF 50V
C6	YF426270CHJS	Ceramic	27 pF 50V	C91	ECEA1ASS470	Electrolytic	47 μ F 10V
C7	YF426681SLKS	Ceramic	680 pF 50V	C92	YF426473XMS	Ceramic	0.047 μ F 50V
C9	YF426104DMS	Ceramic	0.1 μ F 50V	C93	YF426470SLKS	Ceramic	47 pF 50V
C10	ECEA1ASS220	Electrolytic	22 μ F 10V	C94	YF426181SLJS	Ceramic	180 pF 50V
C11	ECEA1ASS470	Electrolytic	47 μ F 10V	C95	YF426101CHJS	Ceramic	100 pF 50V
C12	ECEA1ASS470	Electrolytic	47 μ F 10V	C96,97	YF426102XMS	Ceramic	1000 pF 50V
C13	YF426330CHJS	Ceramic	33 pF 50V	C100	ECSF1AE156	Tantalum	15 μ F 10V
C14	ECEA1ASS470	Electrolytic	47 μ F 10V	C101	YF426472XMS	Ceramic	4700 pF 50V
C15	ECEA1HSS010	Electrolytic	1 μ F 50V	C102	YF426181SLJS	Ceramic	180 pF 50V
C16	YF426473XMS	Ceramic	0.047 μ F 50V	C103	YF426102XMS	Ceramic	1000 pF 50V
C17	ECEA1VSS4R7	Electrolytic	4.7 μ F 35V	C104	ECEA1ASS470	Electrolytic	47 μ F 10V
C18	ECEA1CSS100	Electrolytic	10 μ F 16V	C105	YF426222XKS	Ceramic	2200 pF 50V
C19	ECEA1ASS470	Electrolytic	47 μ F 10V	C106	YF426220SLKS	Ceramic	22 pF 50V
C20	ECEA1ASS220	Electrolytic	22 μ F 10V	C107	YF426221SLKS	Ceramic	220 pF 50V
C21,22	ECEA1ASS470	Electrolytic	47 μ F 10V	C108,109	YF426120CHKKS	Ceramic	12 pF 50V
C23,24	YF426473XMS	Ceramic	0.047 μ F 50V	C112	YF426104DMS	Ceramic	0.1 μ F 50V
C25	YF426330CHJS	Ceramic	33 pF 50V	C115,116	YF426101CHJS	Ceramic	100 pF 50V
C26	ECEA1ASS470	Electrolytic	47 μ F 10V	C120	YF426471SLKS	Ceramic	470 pF 50V
C27	YF426222XMS	Ceramic	2200 pF 50V	C121	YF426473XMS	Ceramic	0.047 μ F 50V
C28	YF426330CHJS	Ceramic	33 pF 50V	C122	YF426472XMS	Ceramic	4700 pF 50V
C29	ECEA1ASS470	Electrolytic	47 μ F 10V	C123	ECSF1AE156	Tantalum	15 μ F 10V
C30-32	ECEA1HSS3R3	Electrolytic	3.3 μ F 50V	C124	ECCF1H220JC	Ceramic	22 pF 50V
C33	ECEA1AK470	Electrolytic	47 μ F 10V	C125	YF426150CHJS	Ceramic	15 pF 50V
C34	ECEA1HSS010	Electrolytic	1 μ F 50V	CT1,2	YFTZ03R300FR	Trimmer Capacitor	30 pF
C42	YF426473XMS	Ceramic	0.047 μ F 50V	CT3	ECRHA070M11	Trimmer Capacitor	70 pF
C43	YF426331SLKS	Ceramic	330 pF 50V	CT4	YFTZ03R300FR	Trimmer Capacitor	30 pF
C44	ECEA1AK470	Electrolytic	47 μ F 10V	DL1	EFDMT645C53B	Delay Line	
C45	YF426470SLKS	Ceramic	47 pF 50V	L1	EL05SI181J	Coil	180 μ H
C46	ECEA1HSS010	Electrolytic	1 μ F 50V	L2	EL05SI8R2K	Coil	8.2 μ H
				L3,4	YWL5100J	Coil	10 μ H
				L5	YWL58R2J	Coil	8.2 μ H

SYM-BOL NO.	PART NO.	DESCRIPTION	SYM-BOL NO.	PART NO.	DESCRIPTION
L6	EL05SI8R2K	Coil 8.2 μ H	Q31	2SD601-QRS	Transistor
L7	YFL5151J	Coil 150 μ H	Q32	2SD1030RST	Transistor
L10	EL05SI8R2K	Coil 8.2 μ H	Q34	2SB709-QRS	Transistor
L12	YWL5271J	Coil 270 μ H	D3	MA151WK	Diode
L13	EL05SI101K	Coil 100 μ H	D4	MA151WA	Diode
SW1	YWSSS21200	Slide Switch	D5,6	MA151WK	Diode
CF1	YFELB5A011	Filter	D7	MA151K	Diode
CF2	YFSLC871154	Filter	D8	MA151WA	Diode
CF3	YFSLC861102	Filter	D9-11	MA151K	Diode
CF4	YFSLC841155	Filter	D13	MA151WA	Diode
CF5	YFSLC841195	Filter	D16	MA151K	Diode
CF6	ELB5A010	Filter	R1	ERJ8GCSG273	Carbon 27K ohms 1/8W
CF7	YFSLC851151	Filter	R2	ERJ8GCSJ223	Carbon 22K ohms 1/8W
CF8	ELB5E047	Filter	R3	ERJ8GCSJ274	Carbon 270K ohms 1/8W
CF9	YFELB5A011	Filter	R4	ERJ8GCSJ154	Carbon 150K ohms 1/8W
CF10	YFSLC841156	Filter	R5	ERJ8GCSJ104	Carbon 100K ohms 1/8W
F1	YFICPF10	Current Fuse	R6	ERJ8GCSJ562	Carbon 5.6K ohms 1/8W
J1-9	ERJ8GCS0R00	Jumper Resistor	R7	ERJ8GCSJ103	Carbon 10K ohms 1/8W
CN1,2-JM	EMCS0350Z	3 pin Jack Male	R8	ERJ8GCSJ682	Carbon 6.8K ohms 1/8W
CN3-JM	EMCS0650Z	6 pin Jack Male	R9	ERJ8GCSJ222	Carbon 2.2K ohms 1/8W
CN4-JM	EMCS0350Z	3 pin Jack Male	R10	ERJ8GCSJ473	Carbon 47K ohms 1/8W
CN5-JM	EMCS0750Z	7 pin Jack Male	R12	ERJ8GCSJ103	Carbon 10K ohms 1/8W
CN6-JM	EMCS0550Z	5 pin Jack Male	R13	ERJ8GCSJ473	Carbon 47K ohms 1/8W
CN7	YF742J2546	6 pin Flat Cable Connector	R14	ERJ8GCSJ222	Carbon 2.2K ohms 1/8W
CN8	YF742J25410	10 pin Flat Cable Connector	R15	ERJ8GCSJ473	Carbon 47K ohms 1/8W
CN9-JM	EMCS0250Z	2 pin Jack Male	R16	ERJ8GCSJ223	Carbon 22K ohms 1/8W
CN10-JM	EMCS0650Z	6 pin Jack Male	R17	ERJ8GCSJ103	Carbon 10K ohms 1/8W
CN11,12-JM	EMCS0950Z	9 pin Jack Male	R18,19	ERJ8GCSG153	Carbon 15K ohms 1/8W
CN13-JM	EMCS0450Z	4 pin Jack Male	R20	ERJ8GCSJ222	Carbon 2.2K ohms 1/8W
M64	YFV2HB0106A4	Shield Cover for Sync	R21	ERJ8GCSJ103	Carbon 10K ohms 1/8W
M65	YFV2HA0102A4	Shield Cover C for Block Filter	R22	ERJ8GCSJ472	Carbon 4.7K ohms 1/8W
M66	YFV2HA0105B3	Shield Case for Sync	R23	ERJ8GCSJ103	Carbon 10K ohms 1/8W
MICROPROCESSOR BOARD.			R24	ERJ8GCSJ106	Carbon 10M ohms 1/8W
PCB4	YFVPKA2004EA	Printed Circuit Board Assy	R25	ERJ8GCSJ474	Carbon 470K ohms 1/8W
IC1	MN1237B	LSI	R26	ERJ8GCSJ223	Carbon 22K ohms 1/8W
IC2	MN1554CVG	LSI	R27	ERJ8GCSJ103	Carbon 10K ohms 1/8W
IC3,4	AN90B82S	IC	R28	ERJ8GCSJ223	Carbon 22K ohms 1/8W
Q1	2SC2404-CD	Transistor	R29	ERJ8GCSJ334	Carbon 330K ohms 1/8W
Q2	2SB709-QRS	Transistor	R30	ERJ8GCSJ102	Carbon 1K ohms 1/8W
Q3-8	2SD601-QRS	Transistor	R31	ERJ8GCSJ222	Carbon 2.2K ohms 1/8W
Q9	2SB814-RST	Transistor	R32	ERJ8GCSJ103	Carbon 10K ohms 1/8W
Q10	2SA1022-BC	Transistor	R33	ERJ8GCSJ222	Carbon 2.2K ohms 1/8W
Q11	2SC2404-CD	Transistor	R34	ERJ8GCSJ331	Carbon 330 ohms 1/8W
Q12	2SB709-QRS	Transistor	R35-37	ERJ8GCSJ103	Carbon 10K ohms 1/8W
Q13	2SD602-QRS	Transistor	R38	ERJ8GCSJ224	Carbon 220K ohms 1/8W
Q14	2SD601-QRS	Transistor	R40,41	ERJ8GCSJ473	Carbon 47K ohms 1/8W
Q15	2SB709-QRS	Transistor	R42-45	ERJ8GCSJ103	Carbon 10K ohms 1/8W
Q16	2SD601-QRS	Transistor	R46	ERJ8GCSJ473	Carbon 47K ohms 1/8W
Q17	2SB709-QRS	Transistor	R47	ERJ8GCSJ223	Carbon 22K ohms 1/8W
Q18,19	2SD601-QRS	Transistor	R48-51	ERJ8GCSJ103	Carbon 10K ohms 1/8W
Q20,30	2SB709-QRS	Transistor	R52	ERJ8GCSJ473	Carbon 47K ohms 1/8W
			R53	ERJ8GCSJ222	Carbon 2.2K ohms 1/8W
			R54	ERJ8GCSJ103	Carbon 10K ohms 1/8W
			R55	ERJ8GCSG392	Carbon 3.9K ohms 1/8W
			R60	ERJ8GCSJ562	Carbon 5.6K ohms 1/8W
			R61	ERJ8GCSJ563	Carbon 56K ohms 1/8W

SYM-BOL NO.	PART NO.	DESCRIPTION		SYM-BOL NO.	PART NO.	DESCRIPTION
R62	ERJ8GCSJ223	Carbon	22K ohms 1/8W	IC11-13	M51325P	IC
R63	ERJ8GCSJ103	Carbon	10K ohms 1/8W	IC14	MN74HC00S	IC
R64	ERJ8GCSJ223	Carbon	22K ohms 1/8W	IC15	YFHD74HC153P	IC
R65	ERJ8GCSJ103	Carbon	10K ohms 1/8W	IC16	MN74HC86S	IC
R66	ERJ8GCSJ683	Carbon	68K ohms 1/8W	IC17	MN4053BS	IC
R67	ERJ8GCSJ104	Carbon	100K ohms 1/8W	IC18	MN6160PBS	IC
R68	ERJ8GCSJ331	Carbon	300 ohms 1/8W	Q1	2SC2404-CD	Transistor
R69	ERJ8GCSG101	Carbon	100 ohms 1/8W	Q2	2SA1022-BC	Transistor
R70	ERJ8GCSJ103	Carbon	10K ohms 1/8W	Q3	2SC2404-CD	Transistor
R71	ERJ8GCSJ824	Carbon	820K ohms 1/8W	Q4,5	2SA1022-BC	Transistor
VR1	YFH0521A2R2K	Variable Resistor	2.2K ohms	Q9	2SD601-QRS	Transistor
Z1	EXBLD6154GU	Block Resistor		Q10,11	2SA1022-BC	Transistor
Z2,3	EXBF7E822J	Block Resistor		Q12,13	2SC2404-CD	Transistor
Z4	EXBLD6154GU	Block Resistor		Q14,15	2SA1022-BC	Transistor
Z5	EXBF9E683J	Block Resistor		Q16	2SK198-Q	Transistor
C2	YF426390CHJS	Ceramic	39 pF 50V	D1,2	MA151K	Diode
C3	YF426470SLKS	Ceramic	47 pF 50V	D3	MA341-FL	Diode
C4	YF426221SLKS	Ceramic	220 pF 50V	D4,5	MA328	Diode
C5	YF426470SLKS	Ceramic	47 pF 50V	R2	YF2116273JT	Carbon 27K ohms 1/16W
C6	ECEA0JSS221	Electrolytic	220 μ F 6.3V	R3	YF2116103JT	Carbon 10K ohms 1/16W
C7	YF426104DMS	Ceramic	0.1 μ F 50V	R4	YF2116152JT	Carbon 1.5K ohms 1/16W
C8	YF426270CHJS	Ceramic	27 pF 50V	R5,6	YF2116221JT	Carbon 220 ohms 1/16W
C9,10	YF426330CHJS	Ceramic	33 pF 50V	R7	YF2116681JT	Carbon 690 ohms 1/16W
C11	ECEA0JSS470	Electrolytic	47 μ F 6.3V	R8	YF2116102JT	Carbon 1K ohms 1/16W
C12,13	ECEA1CSS100	Electrolytic	10 μ F 16V	R9	YF2116242JT	Carbon 2.4K ohms 1/16W
C14	ECEA1AF470	Electrolytic	47 μ F 10V	R10	YF2116751JT	Carbon 750 ohms 1/16W
C15	ECKF1H221KB	Ceramic	220 pF 50V	R11,12	YF2116222JT	Carbon 2.2K ohms 1/16W
C16	ECKF1H471KB	Ceramic	470 pF 50V	R13	YF2116105JT	Carbon 1M ohms 1/16W
C20	ECSF1AE475	Electrolytic	4.7 μ F 10V	R14	YF2116102JT	Carbon 1K ohms 1/16W
C21	ECEA1CSS100	Electrolytic	10 μ F 16V	R30	YF2116183JT	Carbon 18K ohms 1/16W
C22	ECSF1AE475	Electrolytic	4.7 μ F 10V	R33	YF2116271JT	Carbon 270 ohms 1/16W
C23,24	ECSF1AE156	Electrolytic	15 μ F 10V	R34	YF2116202JT	Carbon 2K ohms 1/16W
C25	ECSF1AE106	Electrolytic	10 μ F 10V	R35	YF2116332JT	Carbon 3.3K ohms 1/16W
CT1	ECRHC040E11	Trimmer Capacitor		R36	YF2116392JT	Carbon 3.9K ohms 1/16W
L1	ELEMH101KA	Coil	100 μ H	R37	YF2116622JT	Carbon 6.2K ohms 1/16W
L2	ELEMH8R2KA	Coil	8.2 μ H	R38	YF2116333JT	Carbon 33K ohms 1/16W
X1	KF38J	Crystal Oscillator		R39	YF2116103JT	Carbon 10K ohms 1/16W
X2	KBR4R0M7	Crystal Oscillator	4MHZ	R40	YF2116912JT	Carbon 9.1K ohms 1/16W
J1	ERJ8GCSJ0R00	Jumper Resistor		R41	YF2116183JT	Carbon 18K ohms 1/16W
CN1	YF742J28	8 pin Flat Cable Connector		R42	YF2116272JT	Carbon 2.7K ohms 1/16W
CN2	YFFH111SDSA	11 pin Flat Cable Connector		R43	YF2116112JT	Carbon 1.1K ohms 1/16W
CN3-JM	EMCS0350Z	3 pin Jack Male		R44	YF2116182JT	Carbon 1.8K ohms 1/16W
CN4,5-JM	EMCS0250Z	2 pin Jack Male		R45	YF2116272JT	Carbon 2.7K ohms 1/16W
CN6-JM	EMCS0950Z	9 pin Jack Male		R46	YF2116512JT	Carbon 5.1K ohms 1/16W
CN7-JM	EMCS1050Z	10 pin Jack Male		R47	YF2116752JT	Carbon 7.5K ohms 1/16W
CN8-JM	EMCS0750Z	7 pin Jack Male		R48	YF2116392JT	Carbon 3.9K ohms 1/16W
EXT SYNC-1 BOARD.				R49	YF2116272JT	Carbon 2.7K ohms 1/16W
PCB5	o YFVKB00G1E1A	Printed Circuit Board Assy		R50	YF2116511JT	Carbon 510 ohms 1/16W
IC7	YFTC5081AP	IC		R51	YF2116122JT	Carbon 1.2K ohms 1/16W
IC8	NJM3415M	IC		R52	YF2116562JT	Carbon 5.6K ohms 1/16W
IC9	M51325P	IC		R53,54	YF2116511JT	Carbon 510 ohms 1/16W
IC10	AN90B01S	IC		R55	YF2116103JT	Carbon 10K ohms 1/16W
				R56	YF2116222JT	Carbon 2.2K ohms 1/16W
				R57	YF2116133JT	Carbon 13K ohms 1/16W

SYM-BOL NO.	PART NO.	DESCRIPTION		SYM-BOL NO.	PART NO.	DESCRIPTION	
R58	YF2116123JT	Carbon	12K ohms 1/16W	CT1	YFTZ03N100FR	Trimmer Capacitor	10pF
R59	YF2116822JT	Carbon	8.2K ohms 1/16W	CT2	YFTZ03R200FR	Trimmer Capacitor	20pF
R60,61	YF2116102JT	Carbon	1K ohms 1/16W	L2,3	EL05SI8R2K	Coil	8.2 μ H
R62,63	YF2116222JT	Carbon	2.2K ohms 1/16W	L4	EL05SI101K	Coil	100 μ H
R64	YF2116752JT	Carbon	7.5K ohms 1/16W	L5,6	YFEL05SI2R2K	Coil	2.2 μ H
R65	YF2116561JT	Carbon	560 ohms 1/16W	L7	YFF051054	Coil	
R66	YF2116103JT	Carbon	10K ohms 1/16W	SW1,2	YFSSJ312AN	Slide Switch	
R67	o YF2116681JT	Carbon	680 ohms 1/16W	X1,2	YFMS30917R7G	Crystal Oscillator	
R68	YF2116201GT	Carbon	200 ohms 1/16W	CN1-JM	EMCS0350Z	3 pin Jack Male	
R69	YF2116561JT	Carbon	560 ohms 1/16W	M57	o YFV2HA0238A4	Shield Cover	
R70	o YF2116681JT	Carbon	680 ohms 1/16W	EXT SYNC-2 BOARD.			
R71	YF2116201GT	Carbon	200 ohms 1/16W				
R72	YF2116562JT	Carbon	5.6K ohms 1/16W	PCB6	o YFVKC00G1E1A	Printed Circuit Board Assy	
R73	YF2116112JT	Carbon	1.1K ohms 1/16W	IC1	MN74HC00S	IC	
R74	YF2116752JT	Carbon	7.5K ohms 1/16W	IC2-4	MN74HC221S	IC	
R75	YF2116561JT	Carbon	560 ohms 1/16W	IC5	MN74HC74S	IC	
R76	o YF2116511JT	Carbon	510 ohms 1/16W	IC6	MN74HC221S	IC	
R77	YF2116101GT	Carbon	100 ohms 1/16W	Q6,7	2SC2404-CD	Transistor	
R78	o YF2116471GT	Carbon	470 ohms 1/16W	Q8	2SA1022-BC	Transistor	
R79	YF2116101GT	Carbon	100 ohms 1/16W	R15	YF2116152JT	Carbon	1.5K ohms 1/16W
R80	YF2116222JT	Carbon	2.2K ohms 1/16W	R16,17	YF2116183JT	Carbon	18K ohms 1/16W
R81	o YF2116621GT	Carbon	620 ohms 1/16W	R18	YF2116152JT	Carbon	1.5K ohms 1/16W
R82	YF2116152JT	Carbon	1.5K ohms 1/16W	R19	YF2116222JT	Carbon	2.2K ohms 1/16W
R83	YF2116104JT	Carbon	100K ohms 1/16W	R20	YF2116243JT	Carbon	24K ohms 1/16W
R84,85	YF2116105JT	Carbon	1M ohms 1/16W	R21	YF2116103JT	Carbon	10K ohms 1/16W
R86	YF2116562JT	Carbon	5.6K ohms 1/16W	R22	YF2116102JT	Carbon	1K ohms 1/16W
R87	YF2116513JT	Carbon	51K ohms 1/16W	R23	YF2116152JT	Carbon	1.5K ohms 1/16W
R88	YF2116561JT	Carbon	560 ohms 1/16W	R24	YF2116104JT	Carbon	100K ohms 1/16W
VR2	YF6M2L20K	Variable Resistor	20K ohms	R25	YF2116683JT	Carbon	68K ohms 1/16W
VR4	YF6M2L1K	Variable Resistor	1K ohms	R26	YF2116114JT	Carbon	110K ohms 1/16W
C1,2	ECEA1CKS470	Electrolytic	47 μ F 16V	R27	YF2116162JT	Carbon	1.6K ohms 1/16W
C3	YF400101CHJT	Ceramic	100 pF	R28	YF2116623JT	Carbon	62K ohms 1/16W
C4	YF426823XKS	Ceramic	0.082 μ F 50V	R29	YF2116333JT	Carbon	33K ohms 1/16W
C17	YF426104DMS	Ceramic	0.1 μ F 50V	R31	YF2116753JT	Carbon	75K ohms 1/16W
C23,24	ECEA1AKS470	Electrolytic	47 μ F 10V	R32	YF2116823JT	Carbon	82K ohms 1/16W
C25	YF426473XKS	Ceramic	0.047 μ F 50V	VR1,3	YFH0522A150K	Variable Resistor	
C27	ECSF1AE106	Electrolytic	10 μ F 10V	C5,6	YF400222XKT	Ceramic	2200 pF
C28	ECEA1CKS470	Electrolytic	47 μ F 16V	C7	YF400104FZT	Ceramic	0.1 μ F
C29	YF400150CHJT	Ceramic	15 pF	C8,9	YF400102SLJT	Ceramic	1000 pF
C30,31	ECSF1AE476	Electrolytic	47 μ F 10V	C10	YF400104FZT	Ceramic	0.1 μ F
C32	YF400681SLJT	Ceramic	680 pF	C11	YF400102SLJT	Ceramic	1000 pF
C33	ECEA1AKS470	Electrolytic	47 μ F 10V	C12	YF400151CHJT	Ceramic	150 pF
C34	YF400470CHJT	Ceramic	47 pF	C14,15	YF400101CHJT	Ceramic	100 pF
C35-37	YF400681SLJT	Ceramic	680 pF	C16,19	ECEA1AKS470	Electrolytic	47 μ F 10V
C38	ECSF1AE225	Electrolytic	2.2 μ F 10V	C20	YF400104FZT	Ceramic	0.1 μ F
C39	YF426102CHJS	Ceramic	1000 pF 50V	C21,22	YF400102SLJT	Ceramic	1000 pF
C40	ECSF1CE476	Electrolytic	47 μ F 16V	L1	EL05SI8R2K	Coil	8.2 μ H
C41	YF400100CHDT	Ceramic	10 pF	CN2	YFIH1020-10	10 pin Flat Cable Connector	
C42	YF400241CHJT	Ceramic	240 pF				
C43,44	ECSF1AE476	Electrolytic	47 μ F 10V				
C45	YF400050CHDT	Ceramic	5 pF				
C46,47	YF400103XKT	Ceramic	0.01 μ F				
C48	ECSF1AE476	Electrolytic	47 μ F 10V				
C49	ECEA1HSN010	Electrolytic	1 μ F 50V				
C50	YF400151CHJT	Ceramic	150 pF				

SYM-BOL NO.	PART NO.	DESCRIPTION		SYM-BOL NO.	PART NO.	DESCRIPTION	
AUDIO BOARD.				C8	YF426103XMS	Ceramic	10000 pF 50V
PCB7	YFVKY3230P5A	Printed Circuit Board Assy		C9	ECEA1ASS470	Electrolytic	47 μF 10V
IC1	NJM3414M	IC		C10	ECEA1CSS100	Electrolytic	10 μF 16V
IC2	NJM4558MD	IC		C11	ECEA0JU331	Electrolytic	330 μF 6.3V
IC3	NJM3415M	IC		C12	ECEA1HSS010	Electrolytic	1 μF 50V
Q1-4	2SB709-QRS	Transistor		C13	YF426121CHJS	Ceramic	120 pF 50V
Q5	2SC2405STU	Transistor		C16	ECEA1HSSR47	Electrolytic	0.47 μF 50V
Q6,7	2SC2405STU	Transistor		C17	ECEA1ASS470	Electrolytic	47 μF 10V
Q8	2SB709-QRS	Transistor		C18	ECQM1H223JZ	Plastic	0.022 μF 50V
D1	MA151K	Diode		C19	YF426103XMS	Ceramic	10000 pF 50V
D2	MA153	Diode		C20	ECEA1ASS470	Electrolytic	47 μF 10V
D4,7	MA151K	Diode		C21	ECEA1CSS100	Electrolytic	10 μF 16V
D8	MA151K	Diode		C22	ECEA1HSS010	Electrolytic	1 μF 50V
R1	ERJ8GCSJ223	Carbon	22K ohms 1/8W	C23	YF426121CHJS	Ceramic	120 pF 50V
R2	ERJ8GCSJ104	Carbon	100K ohms 1/8W	C24	ECEA1HNR47	Electrolytic	0.47 μF 50V
R3	ERJ8GCSJ154	Carbon	150K ohms 1/8W	C25	ECEA1ASS470	Electrolytic	47 μF 10V
R4	ERJ8GCSG333	Carbon	33K ohms 1/8W	C26	YF426104DMS	Ceramic	0.1 μF 50V
R5	ERJ8GCSJ102	Carbon	1K ohms 1/8W	C27,28	YF426473XKS	Ceramic	0.047 μF 50V
R6	ERJ8GCSJ222	Carbon	2.2K ohms 1/8W	C29,30	YF426473XMS	Ceramic	0.047 μF 50V
R7	ERJ8GCSJ103	Carbon	10K ohms 1/8W	C31,32	ECCF1H101J	Ceramic	100 pF 50V
R8	ERJ8GCSG752	Carbon	7.5K ohms 1/8W	J1-8	ERJ8GCSJ0R00	Jumper Resistor	
R9,10	ERJ8GCSJ393	Carbon	39K ohms 1/8W	J27,42	ERJ8GCS0R00	Jumper Resistor	
R11	ERJ8GCSG752	Carbon	7.5K ohms 1/8W	J43	ERJ8GCS0R00	Jumper Resistor	
R14	ERJ8GCSJ470	Carbon	47 ohms 1/8W	CN1-JM	EMCS1050Z	10 pin Jack Male	
R15	ERJ8GCSJ223	Carbon	22K ohms 1/8W	CN2-JM	EMCS0550Z	5 pin Jack Male	
R16	ERJ8GCSJ103	Carbon	10K ohms 1/8W	CN3-JM	EMCS0250Z	2 pin Jack Male	
R17	ERJ8GCSJ104	Carbon	100K ohms 1/8W	CN4-8-JM	EMCS0350Z	3 pin Jack Male	
R18	ERJ8GCSJ434	Carbon	430K ohms 1/8W	DISPLAY KEY A BOARD.			
R19	ERJ8GCSJ334	Carbon	330K ohms 1/8W	PCB8	o YFVAKA0352AN	Printed Circuit Board Assy	
R20	ERJ8GCSJ152	Carbon	1.5K ohms 1/8W	DISPLAY KEY B BOARD.			
R21	ERJ8GCSJ331	Carbon	330 ohms 1/8W	PCB9	YFVAKA0162AN	Printed Circuit Board Assy	
R22	ERJ8GCSJ102	Carbon	1K ohms 1/8W	D1	MA151	Diode	
R23	ERJ8GCSJ184	Carbon	180K ohms 1/8W	J1	FSNFLEX11P	Jumper Resistor	
R25	ERJ8GCSG182	Carbon	1.8K ohms 1/8W	EXT MIC BOARD.			
R26	ERJ8GCSG102	Carbon	1K ohms 1/8W	PCB10	YFVKZ3230PAA	Printed Circuit Board Assy	
R29	ERJ8GCSJ102	Carbon	1K ohms 1/8W	JK1, 2	YFM0JB21M	Mic Jack	
R30	ERJ8GCSK8R2	Carbon	8.2 ohms 1/8W	INT MIC BOARD.			
R31	ERJ8GCSJ223	Carbon	22K ohms 1/8W	PCB11	YFVKZ3230PBB	Printed Circuit Board Assy	
R32	ERJ8GCSJ103	Carbon	10K ohms 1/8W	JK1	YFM0JB19M	Earphone Jack	
R33	ERJ8GCSJ152	Carbon	1.5K ohms 1/8W	M54	YFV2SA0089A4	Mounting Angle	
R34	ERJ8GCSJ331	Carbon	330 ohms 1/8W				
R35	ERJ8GCSJ102	Carbon	1K ohms 1/8W				
R36	ERJ8GCSJ184	Carbon	180K ohms 1/8W				
R38	ERJ8GCSJ102	Carbon	1K ohms 1/8W				
R39	ERJ8GCSK8R2	Carbon	8.2 ohms 1/8W				
R41	ERJ8GCSG122	Carbon	1.2K ohms 1/8W				
R44,45	ERJ8GCSG681	Carbon	680 ohms 1/8W				
R46,47	ERJ8GCSJ822	Carbon	8.2K ohms 1/8W				
C1	YF426104DMS	Ceramic	0.1 μF 50V				
C2	YF426271SLJS	Ceramic	270 pF 50V				
C3	ECEA1ASS470	Electrolytic	47 μF 10V				
C4	YF426473XMS	Ceramic	0.047 μF 50V				
C5,6	ECEA0JU101	Electrolytic	100 μF 6.3V				
C7	ECQM1H223JZ	Plastic	0.022 μF 50V				

SYM-BOL NO.	PART NO.	DESCRIPTION	SYM-BOL NO.	PART NO.	DESCRIPTION
SWITCH BOARD.			REC SWITCH BOARD.		
PCB12 Q2 Q3 D1	o YFVKZ00G1E1A 2SD638-QRS 2SD636-QRS YFGL-3HY7H	Printed Circuit Board Assy Transistor Transistor LED	PCB13 SW701	Y WV3100ZK07 KEC10902	Printed Circuit Board Assy Push Switch
R2 R3 R4 R5 R6	ERD10TJ203 ERD10TJ680 ERD10TJ103 ERD10TJ680 ERD10TJ101	Carbon Carbon Carbon Carbon Carbon	ZOOM SWITCH BOARD.		
R7 R8 C1 C2 C4	ERD10TJ301 ERD10TJ750 ECEAOJSS101 ECEAOJU102 ECEA1EU471	20K ohms 1/8W 68 ohms 1/8W 10K ohms 1/8W 68 ohms 1/8W 100 ohms 1/8W Carbon Carbon Electrolytic Electrolytic Electrolytic	PCB14 SW1,2	Y WV3100ZK08 KEG10903	Printed Circuit Board Assy Zoom Push Switch
L1 SW1 F1 JK1 M108	YFEL05SI150K YFSSA043L9P ICPF25 YFM0JB19M YFV2SA0170A4	300 ohms 1/8W 75 ohms 1/8W 100 µF 6.3V 1000 µF 6.3V 470 µF 25V Coil Slide Switch Current Fuse Earphone Jack Mounting Angle for Earphone Jack	FADE/AGC SWITCH BOARD.		
GRIP ASSEMBLY. MISCELLANEOUS.			PCB15 R1 R2 SW1 SW2 SW3,4	o YFVKZ00G1E3A ERD10TJ432 ERD10TJ911 YFSSJ342L4N KEG10903 YWSSS322	Printed Circuit Board Assy Carbon Carbon Slide Switch Push Switch Slide Switch
STANDBY BOARD.			STANDBY BOARD.		
M70 M71 M72 M73 M74	YWCC702KR01A YFV5EA0279A2 YWCC702KR03 YWCC702WM99 YVZC602LM02	Grip Cover for Right Side Grip Cover for Left Side Zoom Switch Bottom Cover Zoom Switch Assy Nut Plate A	PCB16 Q1 Q2 D1 D2	YFVAKA0166AN 2SB793-QRS 2SD636-QRS MA165 YFLN11WP23F	Printed Circuit Board Assy Transistor Transistor Diode LED
M75 M76 M77 M78 M79	YWCC702HR02A YWCC702LR01 YFV2CA0074A4 YFV5YB0006A3 YFV4EA0005A3	REC Button Cord Clamp Push Plate for Grip Belt Grip Belt Mounting Base A	R1 R2 R3 R4 R5	ERD10TJ272 ERD10TJ103 ERD10TJ332 ERD10TJ2R7 ERD10TJ221	Carbon Carbon Carbon Carbon Carbon
M81 M82 M83 M84 M85	YFV4AA0010A2 YFV4AA0011A2 YFV5WA0211A4 YFV5RA0059A3 YFV4EA0004A3	Grip Arm Cover for Right Side Grip Arm Cover for Left Side FADE/AGC Label Grip Lock Knob Mounting Base B	R6 R7 R8 R9 R10	ERD10TJ223 ERD10TJ241 ERD10TJ161 ERD10TJ271 ERD10TJ563	2.7K ohms 1/8W 10K ohms 1/8W 3.3K ohms 1/8W 2.7 ohms 1/8W 220 ohms 1/8W Carbon Carbon Carbon Carbon Carbon
M86 M87 M88 M89 M90	YWCC702WM02 YFV5RA0034A4 YFV5RA0035A4 YFV2TA0059A4 YWCC702LR01	Clutch Spring Fade Knob Slide Switch Knob Nut Plate B Cord Clamp (x2)	R11 VR1 VR2 SW1 SW2	ERD10TJ223 EVJLCA307B34 EVJLCA307B14 KEG10903 YFSSY023L6N	22K ohms 1/8W 240 ohms 1/8W 160 ohms 1/8W 270 ohms 1/8W 56K ohms 1/8W Carbon Variable Resistor Variable Resistor Push Switch Slide Switch
M91 M92 M93 M94 M95	YFV4JA0052A4 YFV4JA0053A4 YFV5KA0054A4 YFV4JA0054A4 YFV1EA0022A4	Coil Spring for - Battery Polarity Plate Spring for + Battery Polarity Battery Cover Coil Spring for Battery Cover Mounting Screw for Battery Cover	M17 M67 M68 M69	o YFV5EN0119A3 YFV5RA0027A4 YFV5RA0029A4 YFV5RA0038A4	Right Bottom Cover Standby Switch Knob REC Review Knob Auto Iris/Balance Regulation Knob
M96 M97	YFV1EA0041A4 YFV2SA0169A4	Mounting Screw for Grip Belt Mounting Angle for Grip Arm			

SYM-BOL NO.	PART NO.	DESCRIPTION		SYM-BOL NO.	PART NO.	DESCRIPTION	
CORRECTION BOARD.				SUBPROCESS BOARD.			
PCB17	o YFVKD00G1E1A	Printed Circuit Board Assy		VR1-15	YFH0621A22KB	Variable Resistor	
IC1-4	NJM3414M	IC		VR16	YFH0621A10KB	Variable Resistor	
Q1	2SD601-QRS	Transistor		C1	ECQV1H823JZ	Plastic	0.082 μF
Q2	2SC2405STU	Transistor		C2	ECEA1HKS010	Electrolytic	1 μF 50V
Q3	2SD601-QRS	Transistor		C3	ECQV1H823JZ	Plastic	0.082 μF
Q4	2SC1583-G	Transistor		C4	ECEA1AKS470	Electrolytic	47 μF 10V
R1	YF2116333JT	Carbon	33K ohms 1/16W	C5	ECQB1H103JZ	Plastic	0.01 μF 50V
R2	YF2116394JT	Carbon	390K ohms 1/16W	C6	YF400473FZT	Ceramic	0.047 μF
R3	YF2116393JT	Carbon	39K ohms 1/16W	C7	YF400681SLJT	Ceramic	680 pF
R4	YF2116474JT	Carbon	470K ohms 1/16W	C8	ECEA1CKS100	Electrolytic	10 μF 16V
R5	YF2116103JT	Carbon	10K ohms 1/16W	C9	YF400104FZT	Ceramic	0.1 μF
R6	YF2116183JT	Carbon	18K ohms 1/16W	C10	ECEA1AKS470	Electrolytic	47 μF 10V
R7	YF2116103JT	Carbon	10K ohms 1/16W	C11	ECEA1CKS100	Electrolytic	10 μF 16V
R8	YF2116183JT	Carbon	18K ohms 1/16W				
R9,10	YF2116332JT	Carbon	3.3K ohms 1/16W				
R11	YF2116102JT	Carbon	1K ohms 1/16W				
R12	YF2116473JT	Carbon	47K ohms 1/16W				
R13	YF2116102JT	Carbon	1K ohms 1/16W				
R14	YF2116103JT	Carbon	10K ohms 1/16W				
R15	YF2116183JT	Carbon	18K ohms 1/16W				
R16	YF2116103JT	Carbon	10K ohms 1/16W				
R17	YF2116183JT	Carbon	18K ohms 1/16W				
R18,19	YF2116332JT	Carbon	3.3K ohms 1/16W				
R20	YF2116102JT	Carbon	1K ohms 1/16W				
R21	YF2116473JT	Carbon	47K ohms 1/16W				
R22	YF2116102JT	Carbon	1K ohms 1/16W				
R23	YF2116332JT	Carbon	3.3K ohms 1/16W				
R24	YF2116133JT	Carbon	13K ohms 1/16W				
R25	YF2116223JT	Carbon	22K ohms 1/16W				
R26,27	YF2116153JT	Carbon	15K ohms 1/16W				
R28	YF2116474JT	Carbon	470K ohms 1/16W				
R29	YF2116103JT	Carbon	10K ohms 1/16W				
R30	YF2116183JT	Carbon	18K ohms 1/16W				
R31	YF2116103JT	Carbon	10K ohms 1/16W				
R32	YF2116183JT	Carbon	18K ohms 1/16W				
R33	YF2116102JT	Carbon	1K ohms 1/16W				
R34,35	YF2116332JT	Carbon	3.3K ohms 1/16W				
R36	YF2116102JT	Carbon	1K ohms 1/16W				
R37	YF2116473JT	Carbon	47K ohms 1/16W				
R38	YF2116183JT	Carbon	18K ohms 1/16W				
R39	YF2116103JT	Carbon	10K ohms 1/16W				
R40	YF2116102JT	Carbon	1K ohms 1/16W				
R41,42	YF2116332JT	Carbon	3.3K ohms 1/16W				
R43	YF2116102JT	Carbon	1K ohms 1/16W				
R44	YF2116473JT	Carbon	47K ohms 1/16W				
R45	YF2116102JT	Carbon	1K ohms 1/16W				
R46	YF2116562JT	Carbon	5.6K ohms 1/16W				
R47	YF2116103JT	Carbon	10K ohms 1/16W				
R48	YF2116222JT	Carbon	2.2K ohms 1/16W				
R49	YF2116103JT	Carbon	10K ohms 1/16W				
R50	YF2116472JT	Carbon	4.7K ohms 1/16W				
R51	YF2116511JT	Carbon	510 ohms 1/16W				
R52	YF2116102JT	Carbon	1K ohms 1/16W				
R53-55	YF2116103JT	Carbon	10K ohms 1/16W				

SYM-BOL NO.	PART NO.	DESCRIPTION	SYM-BOL NO.	PART NO.	DESCRIPTION
M126	YFV5DA0023A4	Blank Plate	L3	YFSIZE201	Coil
M127	YFV4DA0007C4	Dioptric Tube	T1	YFHIPAKEVF70	Flyback Transformer
M128	YFV4JA0049A4	Spring Plate C for CRT Revolution	CN1-JM	EMCS0450Z	4 pin Jack Male
		Stop	CN2-JM	EMCS0850Z	8 pin Jack Male
M129	YWCC704AM03C	Hold Plate for Shoe	POWER ZOOM LENS UNIT		
M130	YFV4JA0059A4	Spring Plate A for Open and Shut			
M131	YFV3CB0032B3	EVF Lens Holder	CN107	YF609705	12 pin Connector Wire Assy
M132	YFV1VA0009A4	Lens	M158	YF509740	Lens Unit
M133	YFV5GA0018A4	Eye Cap	M159	YF509704	Iris Cover
M134	YFV2FA0053A4	Cushion	M160	YW122045	Lens Hood Cap
M135	YFV2FA0049B4	Cushion for CRT (x2)	M161	YW122032	Lens Hood
M137	YFV2VA0010A4	Barrier for CRT	M162	YF122103	Focus Band
M138	YFV1UA0004A4	EVF Mirror	M163	YF146513	Zoom Focus Motor Assy
M139	YFV4JA0048A4	Spring Plate B for Hold Mirror	M164	YF122109	Zoom Band
M141	YWCC704FM02	Special Screw for Shoe	M166	YW318131	Zoom Lever
M142	YFV2FA0014B4	Cushion	M167	YF509710	Lens Mounting Assy
M143	YFV5RA0033BS	Lock Lever Assy	M168	YF509706	ALC Assy
M145	YFV4JA0060B4	Spring Plate	M169	YF509050	Iris Rear Cover
M146	YWS-WULRB03	Caution Label	MICROPHONE ASSEMBLY		
M147	YFV7MA0057A4	Service Man Label for WVP-G1E Series			
M148	YWS-EULRB10	KD Label	M111	YFWM4034UNIT	Mic Unit
M149	YFV7MA0058A4	X-Ray Label for WVP-G1E	M112	YFMLKA0091B4	Mic Cable Assy
EVF BOARD.			M113	YWM6CA0009A4	Wind Screen
			M114	YFWM4034CASE	Head Case Assy
PCB19	YFVPKA0706JB	Printed Circuit Board Assy	M115	YWM5KA0181A3	Case
Q1	2SD1083	Transistor	M116	YPM-MG165AA4	Cord Clamp Cushion
Q2	2SB642-QRS	Transistor	M117	YWM5UA0004B4	Pipe
D1	MA165	Diode			
R1	ERD25FJ565	Carbon 5.6M ohms 1/4W			
R2	ERD25FJ275	Carbon 2.7M ohms 1/4W			
R3	ERD10TJ105	Carbon 1M ohms 1/8W			
R4	ERD10TJ223	Carbon 22K ohms 1/8W			
R6	ERD10TJ101	Carbon 100 ohms 1/8W			
R7	ERD10TJ222	Carbon 2.2K ohms 1/8W			
R8	ERD10TJ103	Carbon 10K ohms 1/8W			
R9	ERD10TJ822	Carbon 8.2K ohms 1/8W			
R10	ERD10TJ472	Carbon 4.7K ohms 1/8W			
VR1	EVM45GA00BV6	Variable Resistor 5.6M ohms			
VR2	YWH0521A1M	Variable Resistor 1M ohms			
VR3	YWH0651A4R7K	Variable Resistor 4.7K ohms			
C1,2	YFDE905B152K	Ceramic 1500 pF 50V			
C3	ECQV05823JZ	Plastic 0.082 μ F 50V			
C4	ECCF1H181J	Ceramic 180 pF			
C5	ECEA1HSS010	Electrolytic 1 μ F 50V			
C6	ECEA1ASS470	Electrolytic 47 μ F 10V			
C7	ECEA1ASS221	Electrolytic 220 μ F 10V			
C8	ECQP1562JZ	Plastic 5600 pF 100V			
C9	ECEA10Z100	Electrolytic 100 μ F 10V			
C10	ECEA1ASS470	Electrolytic 47 μ F 10V			
C11	ECEA1ASS470	Electrolytic 47 μ F 10V			
L1	YFVC101J	Coil 100 μ H			
L2	ELH5L62	Coil			

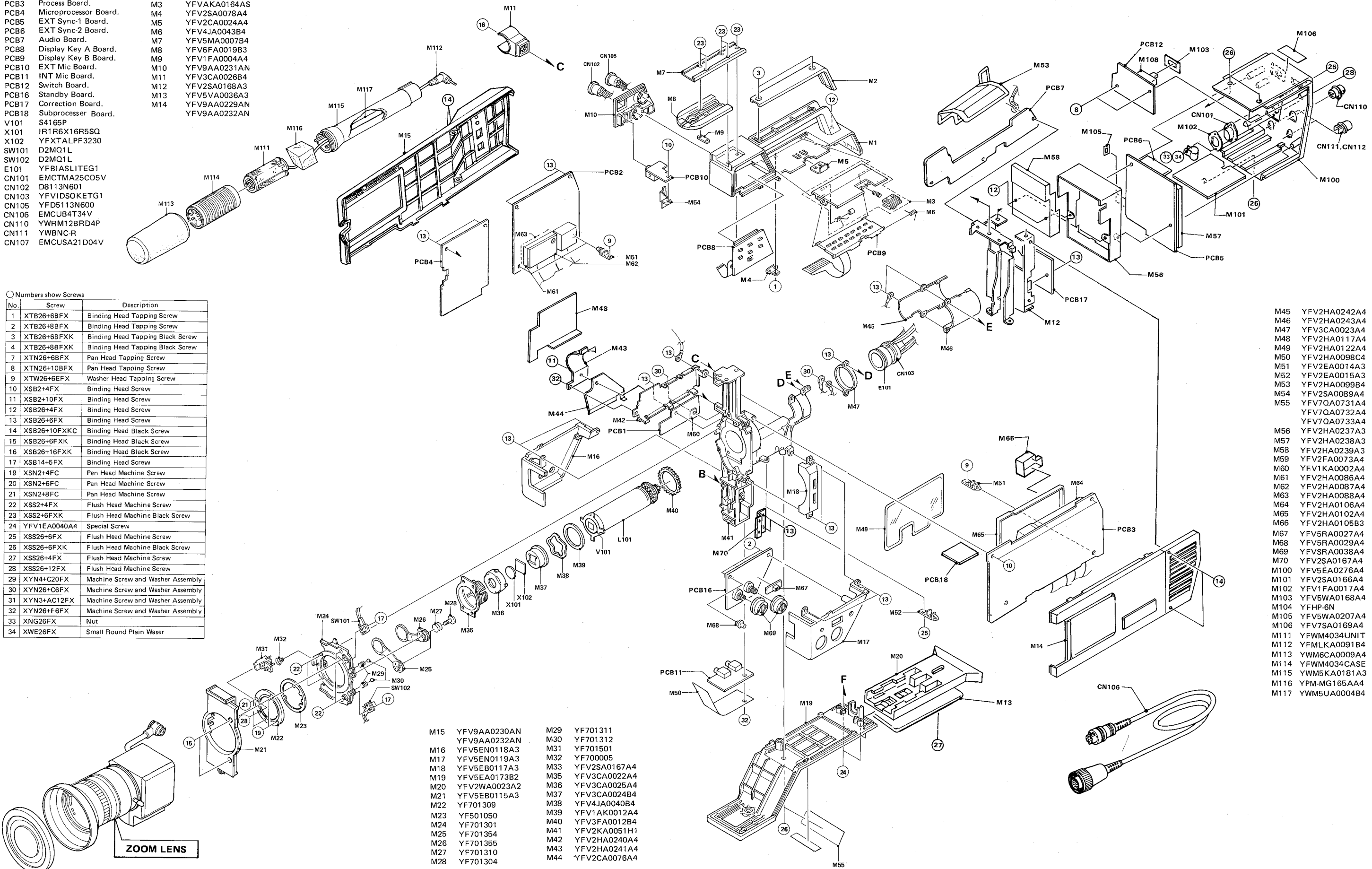
SYM-BOL NO.	PART NO.	DESCRIPTION	SYM-BOL NO.	PART NO.	DESCRIPTION
ACCESSORY PARTS/PACKAGING PARTS.					
BAT1	UM3NEP	UM-3, AM-3 Battery for WVP-G1E Series			
	UM3NE	UM-3, AM-3 Battery for WVP-G1N Series			
CN50	YWRM12BPG4S	4 pin Plug			
M181	o YFV8QA0745AN	Operating Instruction			
	o YFV8QA0747AN	Operating Instruction for WVP-G1ES			
	o YFV8QA0749AN	Operating Instruction for WVP-G1N			
	o YFV8QA0753AN	Operating Instruction for WVP-G1NA			
M182	MET77025902	Product Service Guide for WVP-G1E Series			
M183	19998700331	Warranty Card for WVP-G1EB			
	19998700308	Warranty Card for WVP-G1EG			
	YFV8UA0004A4	Warranty Card for WVP-G1NA			
M184	YFV8RA0064AN	Hand Book for WVP-G1E Series			
	YFV8RA0065AN	Hand Book for WVP-G1ES			
	YFV8RA0066AN	Hand Book for WVP-G1N Series			
M185	XZB38X50A03	Polyethylene Bag for Camera			
M186	XZB26X40C05	Polyethylene Bag for Printed			
M187	XZB20X35A02	Polyethylene Bag for EVF and Cord			
M188	YWT10X35C03	Polyethylene Bag for Microphone			
M189	YWT050803	Polyethylene Bag for Plug			
M190	o YFV9CA0573AN	Packaging for WVP-G1E Series			
	o YFV9CA0574AN	Packaging for WVP-G1N			
	o YFV9CA0575AN	Packaging for WVP-G1NA			
M191	YWS-SNPRB06	Packaging Label			

EXPLODED VIEW OF CAMERA

PCB1	Preamplifier Board.	M1	YFV5EA0124A1
PCB2	Deflection Board.	M2	YFV5EB0125A3
PCB3	Process Board.	M3	YFVAKA0164AS
PCB4	Microprocessor Board.	M4	YFV2SA0078A4
PCB5	EXT Sync-1 Board.	M5	YFV2CA0024A4
PCB6	EXT Sync-2 Board.	M6	YFV4JA0043B4
PCB7	Audio Board.	M7	YFV5MA0007B4
PCB8	Display Key A Board.	M8	YFV6FA0019B3
PCB9	Display Key B Board.	M9	YFV1FA0004A4
PCB10	EXT Mic Board.	M10	YFV9AA0231AN
PCB11	INT Mic Board.	M11	YFV3CA0026B4
PCB12	Switch Board.	M12	YFV2SA0168A3
PCB16	Standby Board.	M13	YFV5VA0036A3
PCB17	Correction Board.	M14	YFV9AA0229AN
PCB18	Subprocessor Board.		YFV9AA0232AN
V101	S4165P		
X101	IR1R6X16R5SQ		
X102	YFXTALPF3230		
SW101	D2MQ1L		
SW102	D2MQ1L		
E101	YFBASLITEG1		
CN101	EMCTMA25CO5V		
CN102	DB113N601		
CN103	YFVIDSOKETG1		
CN105	YFD5113N600		
CN106	EMCUB4T34V		
CN110	YWRM12BRD4P		
CN111	YWBNC-R		
CN107	EMCUSA21D04V		

Numbers show Screws

No.	Screw	Description
1	XTB26+6BFX	Binding Head Tapping Screw
2	XTB26+8BFX	Binding Head Tapping Screw
3	XTB26+6BFXK	Binding Head Tapping Black Screw
4	XTB26+8BFXK	Binding Head Tapping Black Screw
7	XTN26+6BFX	Pan Head Tapping Screw
8	XTN26+10BFX	Pan Head Tapping Screw
9	XTW26+6EFX	Washer Head Tapping Screw
10	XSB2+4FX	Binding Head Screw
11	XSB2+10FX	Binding Head Screw
12	XSB26+4FX	Binding Head Screw
13	XSB26+6FX	Binding Head Screw
14	XSB26+10FXKC	Binding Head Black Screw
15	XSB26+6FXK	Binding Head Black Screw
16	XSB26+16FXK	Binding Head Black Screw
17	XSB14+5FX	Binding Head Screw
19	XSN2+4FC	Pan Head Machine Screw
20	XSN2+6FC	Pan Head Machine Screw
21	XSN2+8FC	Pan Head Machine Screw
22	XSS2+4FX	Flush Head Machine Screw
23	XSS2+6FXK	Flush Head Machine Black Screw
24	YFV1EA0040A4	Special Screw
25	XSS26+6FX	Flush Head Machine Screw
26	XSS26+6FXK	Flush Head Machine Black Screw
27	XSS26+4FX	Flush Head Machine Screw
28	XSS26+12FX	Flush Head Machine Screw
29	XYN4+C20FX	Machine Screw and Washer Assembly
30	XYN26+C6FX	Machine Screw and Washer Assembly
31	XYN3+AC12FX	Machine Screw and Washer Assembly
32	XYN26+16FX	Machine Screw and Washer Assembly
33	XNG26FX	Nut
34	XWE26FX	Small Round Plain Washer

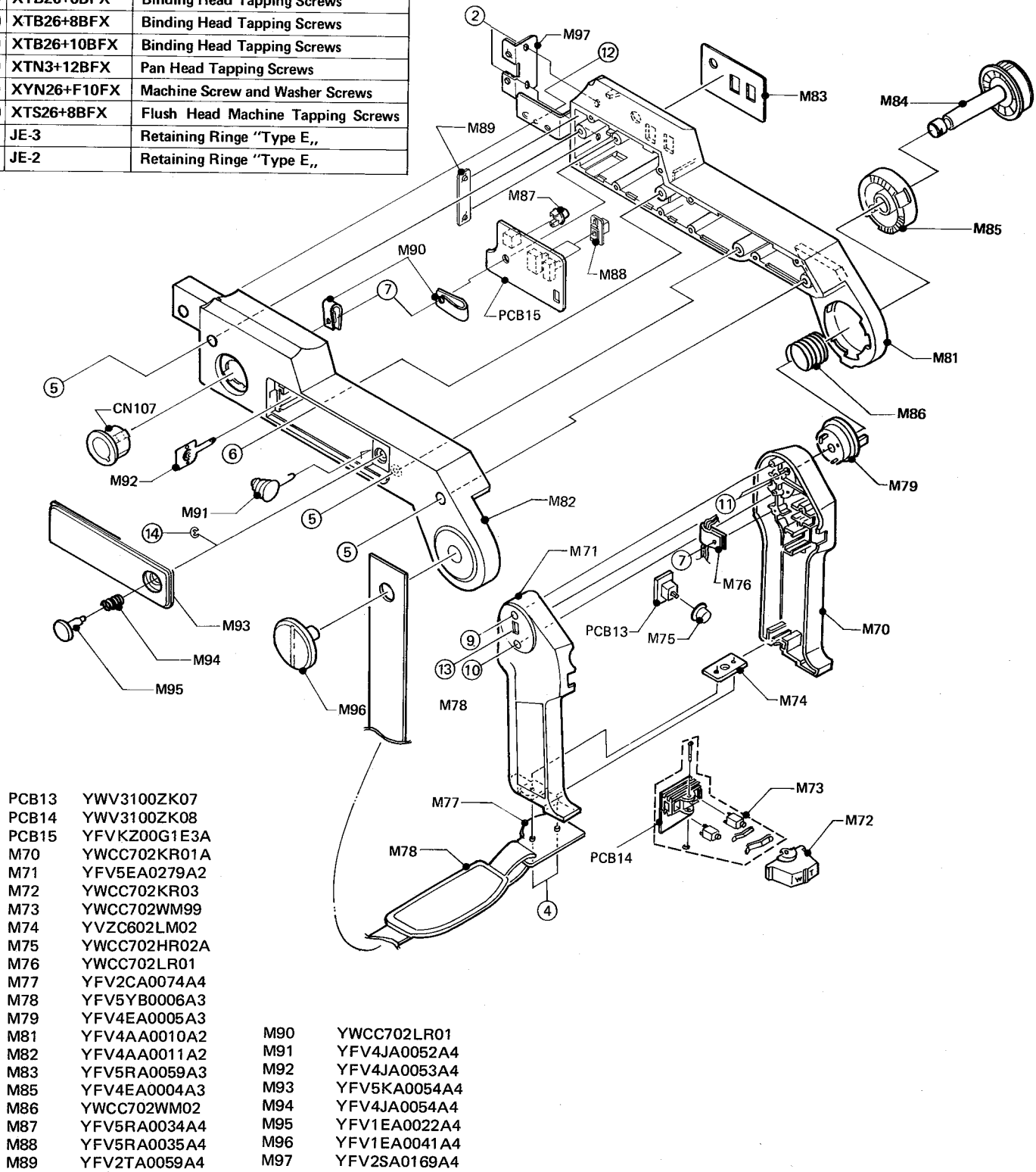


EXPLODED VIEW

GRIP ASSEMBLY

Numbers Show Screws.

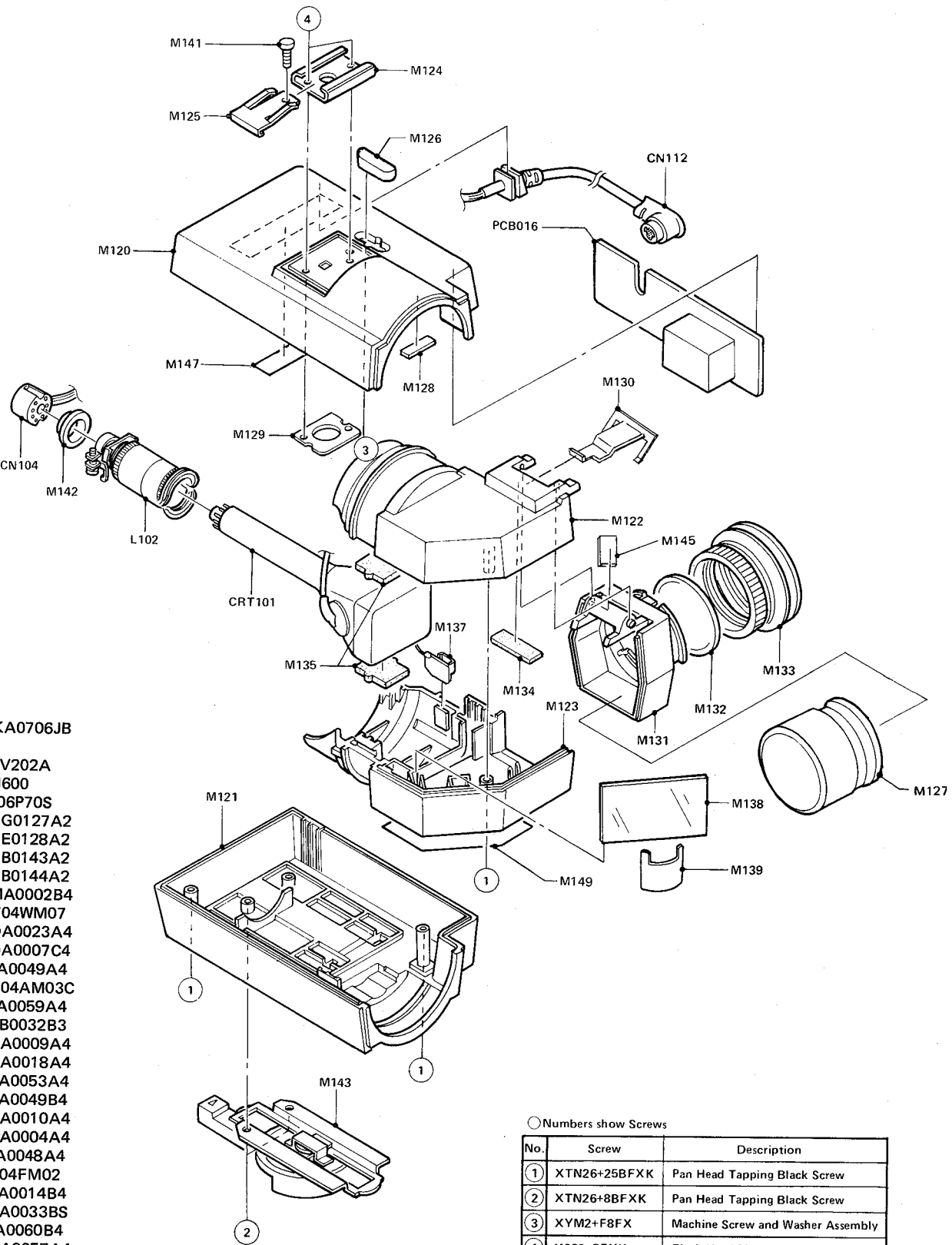
No.	Screws.	Description.
1	XBS26+8FXK	Binding Head Black Screws
2	XSB26+6FX	Binding Head Screws
3	XSB3+6FXK	Binding Head Black Screws
4	XSS26+12FXK	Flush Head Machine Black Screws.
5	XTB3+35BFXK	Binding Head Tapping Black Screws
6	XTB3+12BFXK	Binding Head Tapping Black Screws
7	XTB26+6BFX	Binding Head Tapping Screws
8	XTB26+8BFX	Binding Head Tapping Screws
9	XTB26+10BFX	Binding Head Tapping Screws
10	XTN3+12BFX	Pan Head Tapping Screws
11	XYN26+F10FX	Machine Screw and Washer Screws
12	XTS26+8BFX	Flush Head Machine Tapping Screws
13	JE-3	Retaining Ring "Type E,,
14	JE-2	Retaining Ring "Type E,,



PCB13	YWV3100ZK07	
PCB14	YWV3100ZK08	
PCB15	YFVKZ00G1E3A	
M70	YWCC702KR01A	
M71	YFV5EA0279A2	
M72	YWCC702KR03	
M73	YWCC702WM99	
M74	YVZC602LM02	
M75	YWCC702HR02A	
M76	YWCC702LR01	
M77	YFV2CA0074A4	
M78	YFV5YB0006A3	
M79	YFV4EA0005A3	
M81	YFV4AA0010A2	M90 YWCC702LR01
M82	YFV4AA0011A2	M91 YFV4JA0052A4
M83	YFV5RA0059A3	M92 YFV4JA0053A4
M85	YFV4EA0004A3	M93 YFV5KA0054A4
M86	YWCC702WM02	M94 YFV4JA0054A4
M87	YFV5RA0034A4	M95 YFV1EA0022A4
M88	YFV5RA0035A4	M96 YFV1EA0041A4
M89	YFV2TA0059A4	M97 YFV2SA0169A4

ELECTRIC VIEWFINDER

PCB19	YFVPKA0706JB
CRT101	40JB4
L102	ELY15V202A
CN112	E8130J600
CN113	YFS7506P70S
M120	YFV5EG0127A2
M121	YFV5EE0128A2
M122	YFV5EB0143A2
M123	YFV5EB0144A2
M124	YFV5MA0002B4
M125	YWCC704WM07
M126	YFV5DA0023A4
M127	YFV4DA0007C4
M128	YFV4JA0049A4
M129	YWCC704AM03C
M130	YFV4JA0059A4
M131	YFV3CB0032B3
M132	YFV1VA0009A4
M133	YFV5GA0018A4
M134	YFV2FA0053A4
M135	YFV2FA0049B4
M137	YFV2VA0010A4
M138	YFV1UA0004A4
M139	YFV4JA0048A4
M141	YWCC704FM02
M142	YFV2FA0014B4
M143	YFV5RA0033BS
M145	YFV4JA0060B4
M147	YFV7MA0057A4
M149	YFV7MA0058A4



Numbers show Screws

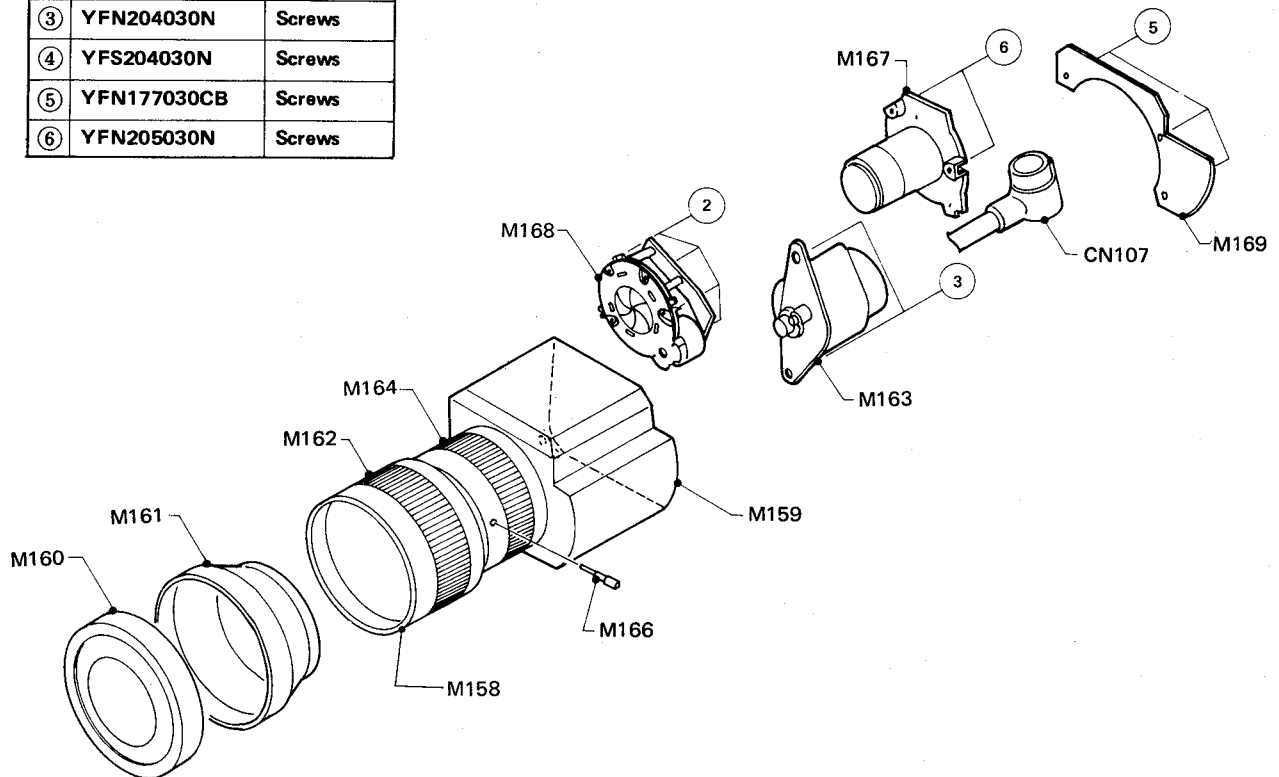
No.	Screw	Description
1	XTN26+25BFXK	Pan Head Tapping Black Screw
2	XTN26+8BFXK	Pan Head Tapping Black Screw
3	XYM2+F8FX	Machine Screw and Washer Assembly
4	XSS2+5FXK	Flush Head Machine Screw

EXPLODED VIEW

POWER ZOOM LENS

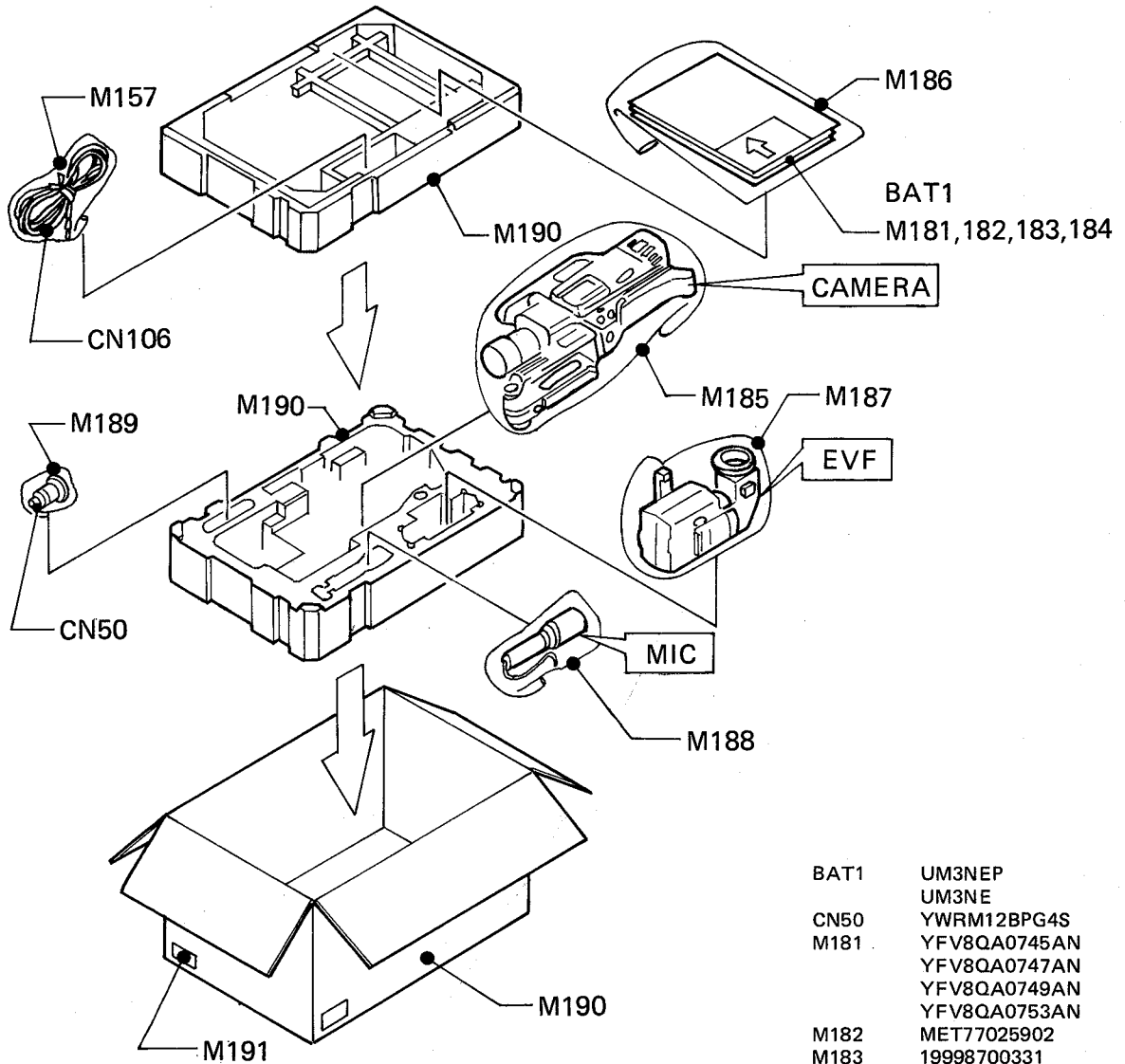
○ Numbers Show Screws

No.	Screws	Description
①	YFN204535N	Screws
②	YFN173030KB	Screws
③	YFN204030N	Screws
④	YFS204030N	Screws
⑤	YFN177030CB	Screws
⑥	YFN205030N	Screws



CN107	YF509705
M158	YF509740
M159	YF509704
M160	YW122045
M161	YW122032
M162	YF122103
M163	YF146513
M164	YF122109
M166	YW318131
M167	YF509710
M168	YF509706
M169	YF509050

PACKAGING



BAT1	UM3NEP
	UM3NE
CN50	YWRM12BPG4S
M181	YFV8QA0745AN
	YFV8QA0747AN
	YFV8QA0749AN
	YFV8QA0753AN
M182	MET77025902
M183	19998700331
	19998700308
	YFV8UA0004A4
M184	YFV8RA064AN
	YFV8RA065AN
	YFV8RA0066AN
M185	XZB38X50A03
M186	XZB26X40C05
M187	XZB20X35A02
M188	YWT10X35C03
M189	YWT050803
M190	YFV9CA0573AN
	YFV9CA0574AN
	YFV9CA0575AN
M191	YWS-SNPRB06